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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 373

WATER RESOURCES OF HAWAII

1913

BY

G. K. LARRISON

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CONTENTS.

	Page.
Authority for investigations	7
Cooperation	8
Scope of work	9
Field methods of measuring stream flow	9
Base data	9
Weir measurements	10
Velocity-area method	11
Definition of terms	15
Convenient equivalents	16
Office methods of computing and studying the discharge and run-off	17
Explanation of tables	20
Accuracy of field data and computed results	21
Division of work	22
Gaging stations maintained in Hawaii	22
Gaging-station records	27
Island of Kauai	27
Waimea River near Waimea	27
Kawaikoi Stream near Waimea	28
Waialae River near Waimea	29
Waimea ditch near Waimea	31
Makaweli River near Waimea	31
Halekua Stream near Waimea	32
Olokele ditch at tunnel No. 12 near Makaweli	33
Olokele ditch at weir near Makaweli	35
Poowaiomahaihai ditch near Waimea	36
Hanapepe River at Koula near Eleele	37
Hiloa ditch at Hanapepe Falls near Eleele	38
Hanapepe ditch at Koula near Eleele	40
Hanapepe ditch at weir near Hanapepe	41
Huleia River near Lihue	43
Hanamaulu River at Kapaia near Lihue	45
South Fork of Wailua River above Waiehu Falls near Lihue	46
Hanamaulu ditch near Lihue	48
Lihue ditch near Lihue	49
North Fork of Wailua River near Lihue	50
Kanaha ditch near Lihue	51
East Branch of North Fork of Wailua River near Lihue	53
Konohiki Stream at Makakualele weir (mauka) near Kealia	55
South Fork of Kaehulua Stream at Wainamunamu weir near Kealia	56
Kaehulua Stream at Kuhinoa weir near Kealia	57
North Fork of Kaehulua Stream at Kainahola weir, near Kealia	58
Kapaa River near Kealia	59
Akulikuli Spring near Kealia	60
Kapahi ditch at Kapahi, near Kealia	61
Kaneha ditch near Kealia	62
Anahola River above dam at Kiokala, near Kealia	63

Gaging-station records—Continued.
Island of Kauai—Continued. Page.
Anahola ditch at Kiokala, near Kealia ... 64
Kalihiwai River near Kilauea ... 65
Hanalei River near Hanalei ... 67
Kuna ditch near Hanalei ... 68
Wainiha River (east and west channels) near Wainiha ... 69
Miscellaneous measurements ... 73
Island of Oahu ... 74
Kalihi Stream at Kioi pool, near Honolulu ... 74
Nuuanu Stream at Luakaha weir, in upper Nuuanu Valley, near Honolulu ... 75
Nuuanu Stream below reservoir No. 2, wasteway, near Honolulu ... 75
Lulumaha ditch at upper Nuuanu reservoir near Honolulu ... 76
Pauoa Stream at upper Pauoa Valley, near Honolulu ... 78
Kahuawai Spring at upper Pauoa Valley, near Honolulu ... 79
Manoa Stream at upper Manoa Valley, near Honolulu ... 80
Manoa Stream at College of Hawaii, near Honolulu ... 80
East Branch of Manoa Stream at upper Manoa Valley, near Honolulu ... 82
West Branch of Manoa Stream at upper Manoa Valley, near Honolulu ... 84
Waiomao Stream at upper Palolo Valley, near Honolulu ... 85
Waimanalo ditch below main reservoir, near Waimanalo ... 86
Makawao ditch at Makawao flume, near Waimanalo ... 88
Makawao Stream in Kailua Valley, near Kailua ... 89
Kaimi Stream in Kailua Valley, near Kailua ... 91
Kamakalepo Stream in Kailua Valley, near Kailua ... 93
Pohakea Stream in Kailua Valley, near Kailua ... 94
South Branch of Kahanaiki Stream in Kailua Valley, near Kailua ... 96
North Branch of Kahanaiki Stream in Kailua Valley, near Kailua ... 96
Waiahole Stream at Manianiaula, near Waikane ... 97
Right Branch of North Fork of Kaukonahua Stream near Wahiawa ... 99
Left Branch of North Fork of Kaukonahua Stream near Wahiawa ... 100
South Fork of Kaukonahua Stream near Wahiawa ... 102
Miscellaneous measurements ... 103
Island of Maui ... 104
Iao Stream near Wailuku ... 104
Maniania ditch near Wailuku ... 105
South Waiehu Stream near Wailuku ... 106
South Waiehu ditch near Wailuku ... 107
North Waiehu Stream near Wailuku ... 109
Waihee Stream near Waihee ... 110
Spreckels ditch near Waihee ... 112
Kahakuloa Stream at Kahakuloa, near Waihee ... 113
Kahakuloa Stream near Honokahau ... 113
Honokahau Stream near Honokahau ... 115
Honokahau ditch at intake near Honokahau ... 116
Honolua Stream near Honokahau ... 117
Honokawai Stream near Lahaina ... 118
Honokawai ditch near Lahaina ... 119
Kahoma ditch at weir near Lahaina ... 121
Lahainaluna Stream near Lahaina ... 122
Lahainaluna ditch near Lahaina ... 124
Kauaula ditch near Lahaina ... 126
Launiupoko Stream near Lahaina ... 127

Gaging-station records—Continued.
Island of Maui—Continued. Page.
Olowalu Stream near Olowalu 128
Olowalu ditch No. 1 near Olowalu 129
Waikapu Stream near Waikapu 131
South Side Waikapu ditch near Waikapu 131
Palolo ditch near Waikapu 132
Haipuaena Stream (old station) near Huelo 134
Haipuaena Stream (new station) near Huelo 134
Puohakamoa Stream (old station) near Huelo 135
Puohakamoa Stream (new station) near Huelo 136
Alo Stream near Huelo 137
Waikamoi Stream near Huelo 138
Oopuola Stream near Huelo 139
Spreckels ditch at gage No. 1, near Huelo 141
Spreckels ditch at gage No. 2, near Huelo 141
Spreckels ditch at gage No. 3, near Huelo 142
Spreckels ditch at gage No. 4, near Huelo 142
Spreckels ditch at gage No. 5, near Huelo 143
Spreckels ditch at gage No. 6, near Huelo 143
Spreckels ditch at gage No. 8, near Huelo 144
Nailiilihaele Stream near Huelo 144
Kailua Stream near Huelo 145
Oanui Stream near Huelo 146
Hoolawanui Stream near Huelo 147
Hoolawaliilii Stream near Huelo 148
Honopou Stream near Huelo 149
Miscellaneous measurements 151
Island of Hawaii 152
General conditions 152
Hilo group 153
Stations at 2,700-foot level 153
Wailuku River near Hilo 166
Honolii River at Kaiwiki near Hilo 167
Hamakua group 168
Hamakua ditch at main weir, Puualala, near Waimea 168
New Hamakua ditch at main weir near Kukuihaele 169
Kohala group 170
Kohala ditch near Kohala 170
Kehela ditch at Honokane Mauka, near North Kahala 173
Miscellaneous measurements 174
Rain gaging 174
Index 187

WATER RESOURCES OF HAWAII, 1913.

By G. K. Larrison.

AUTHORITY FOR INVESTIGATIONS.

This volume contains results of measurements of the flow of certain streams and ditches and rainfall records of the Territory of Hawaii made during the calendar year 1913. The investigations leading to the report were made by the United States Geological Survey in cooperation with the Territory of Hawaii, under the general sanction of the organic law of the Survey (Stat. L., vol. 20, p. 394), which contains the following paragraph:

> *Provided*, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

> For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

The legislature of the Territory of Hawaii approved on March 22, 1909, "An act to promote the conservation and development of the natural resources of the Territory," which provided in substance as follows: A special tax of 2 per cent shall be levied, assessed, and collected annually on all incomes in excess of $4,000; and all amounts so collected shall constitute a special fund to be expended only for the encouragement of immigration and the conservation of natural resources in the proportion of three-fourths for immigration and one-fourth for conservation. The conservation fund shall be used for the development, conservation, improvement, and utilization of the natural resources, and shall be available for expenditure at such times and in such manner as a board of three persons appointed in accordance with section 80 of the organic act shall, with the approval of the governor, determine.

An act of April 26, 1911, amended the original act so as to extend it until December 31, 1913.

On April 4, 1913, the governor of the Territory of Hawaii approved the following acts providing (act 56) for the creation and maintenance of a division of hydrography under the board of agriculture and forestry, and (act 57) appropriating the revenues from water licenses for the use of the board of commissioners of agriculture and forestry toward forest protection and hydrographic surveying.

Section 1 of act 56 reads:

The board of agriculture and forestry is hereby authorized to create and maintain a division of hydrography for the investigation and determination of the water resources of the Territory by the gaging of streams and rainfall and other means, in cooperation with the United States Geological Survey or otherwise, and in furtherance thereof to take over and exercise the functions of the Territory in the conduct of the present hydrographic survey of the Territory.

Section 2 provides that this act shall take effect on July 1, 1913.

Section 1 of act 57 reads:

All revenues derived from water licenses, issued by the Territory, during the period beginning July 1, 1913, and ending June 30, 1915, whether by way of rentals or otherwise, shall constitute and be held as a special fund in the treasury of the Territory to be disbursed on warrants of the auditor issued on approved vouchers of the president of the board of commissioners of agriculture and forestry. Such moneys shall be apportioned and applied from time to time by the board of commissioners of agriculture and forestry, acting with the approval of the governor, equally between the division of forestry and the division of hydrography to the following general purposes, and not otherwise:

1. For the protection of forest reservations, established or set apart according to law, against damage by fire, animals, and otherwise by means of fences and any other means whatsoever, and for the expenditures of the division of forestry.

2. For the development and maintenance of the hydrographic survey throughout the Territory.

Each voucher against said fund shall designate the general purpose for which it is drawn.

Section 2 provides that this act also shall take effect on July 1, 1913.

COOPERATION.

Under the authority conferred by the Federal and Territorial legislation, the Director of the United States Geological Survey and the governor of the Territory of Hawaii entered into a cooperative agreement, dating from July 1, 1910, for "the gaging of streams and the determination of the water supply of the Territory of Hawaii." [1]

The principal features of this agreement are:

1. The United States Geological Survey assumes the responsibility of gathering, analyzing, and publishing the data.

2. During the progress of the work all notes, maps, and data gathered as a result of field studies are at all times open to inspection by

[1] The United States Geological Survey is also cooperating with the Territory of Hawaii in mapping the several islands. The whole of the island of Kauai and a part of the island of Hawaii have been mapped.

the representative of the Territory, and if they are not entirely satisfactory the agreement can be terminated.

3. Accounts for payment of salaries, travel, and subsistence, supplies, or other expenses necessary to the completion of the work shall be rendered in the manner required by the laws and regulations of the contracting parties, and vouchers shall be preferred to either party for payment according as it may be convenient or according to the balance remaining in the respective allotments.

4. The cost of publication is borne entirely by the Geological Survey.

The Territory of Hawaii was represented in the cooperation by the board of conservation appointed by Gov. Walter F. Frear, and consisted of J. P. Cooke (chairman), J. W. Caldwell, and E. V. Wilcox, until June 30, 1913. After this date the Territory was represented by the board of commissioners of agriculture and forestry, consisting of W. M. Giffard (president and executive officer), A. Waterhouse, J. M. Dowsett, H. M. von Holt, and A. H. Rice.

SCOPE OF WORK.

The investigations of stream flow in the Territory are not complete, nor do they include all the streams that might advantageously be studied. They include, however, as many of the streams and ditches on the four larger islands as the available appropriations would allow. It is essential that records of stream flow should be kept during a period of years long enough to determine within reasonable limits the range of flow from the maximum to the minimum. The length of such a period manifestly varies for different streams. Experience has shown that the records should be kept from 20 to 30 years.

In the performance of this work an effort is made to reach the highest degree of precision possible with a rational expenditure of time and money. In all engineering work there is a point beyond which refinement is needless and wasteful, and this statement applies with especial force to stream-measurement work in Hawaii. It has been found, however, that it is possible to obtain data which are sufficiently accurate, although many of those presented in this report are for periods too short to admit of definite conclusions.

FIELD METHODS OF MEASURING STREAM FLOW.

BASE DATA.

In making plans for power, irrigation, municipal water supply, and other projects involving the use of water from surface streams it is necessary to have data from which both the total flow of the stream and its distribution from day to day throughout the year can be obtained. The data necessary for obtaining such information are

daily gage heights, which give the fluctuations of rise and fall of the stream, and measurements of discharge at various stages, from which a rating curve and table can be prepared, giving the discharge for any stage. Such a rating is possible from the fact that so long as the conditions at the controlling point in the stream remain the same there will be approximately the same discharge for any given gage height.

The determination of a discharge is termed a discharge measurement, and points at which discharge measurements are made and records of daily fluctuations of stage are kept for determining the daily flow are termed gaging stations.

Gaging stations may be divided into two classes, known as weir stations and velocity-area stations. At weir stations the head of water on the crest of the weir is measured and the discharge computed by means of a formula. The discharge at velocity-area stations is obtained by measuring the velocity of the current and the area of the cross-section, the product of the two giving the discharge.

The data presented in this paper were collected at both weir and velocity-area stations.

WEIR MEASUREMENTS.

Unquestionably a weir properly constructed and of a type for which accurate coefficients have been determined is one of the most convenient and reliable means of measuring small quantities of water. In practice, however, weirs rarely conform to the requirements imposed by the experimenter who derived the coefficients. If the crest of the weir is sharp and clean and sufficiently high above the bottom of the leading channel and the end contractions are complete and the velocity of approach is wanting, or negligibly small, andif the head on crest is measured at a distance back of the overfall of at least the weir crest length, the Francis formula will give good results. On the other hand, if these essential conditions are not complied with, especially if the velocity of approach is considerable and the contractions are imperfect, the Francis formula will not give accurate results. This is particularly true if the weir is improperly constructed and there is leakage around and under it, as is so frequently the case in practice.

Observations made on various types of weirs in Hawaii show that of the weirs in use in the Territory not all are giving accurate results. If the error is known so that corrections can be made the trouble is largely mitigated, but faulty weir records are too often accepted without investigation as to their accuracy.

VELOCITY-AREA METHOD.

The velocity-area method of measurement consists of determining the mean or average velocity of the water past a given cross-section area. The area of the cross section at right angles to the direction of flow is determined by soundings which are taken at such distances apart as will develop the contour of the stream bed. The depths are recorded and also their distances from some arbitrarily chosen initial point on one side of the stream.

The method of making the soundings depends on the size and stage of the stream. On ditches and small streams, where the depths and velocities are not large, a graduated rod may be used to advantage; on large streams, which must be measured from bridges or cables, a lead weight and sounding line must be used. The weights are of different sizes—6½, 10, or 15 pounds—according to the swiftness of the current, and are torpedo shaped, so as to offer as little resistance as possible to the moving water.

On streams with beds which are permanent or nearly so a standard cross section is usually constructed from careful soundings and referred to the zero of the gage, so that the depths for any stage can be found by adding the gage height at that stage to the depths below the zero of the gage. This method is especially useful at high stages, when it is difficult to make accurate soundings.

After the cross-section area of the stream has been measured by soundings and horizontal distances, the velocity is determined at a number of points. These measurements of velocity should be made at frequent intervals across the stream and close enough to take account of any abrupt change in the velocity. For convenience, the velocities are usually observed in the same verticals at which soundings are made. On some streams fairly good measurements of velocities may be made by means of subsurface floats. This method is applicable, however, only to channels of uniform cross-section area over a considerable distance and is very unsatisfactory for use on natural streams like those of Hawaii.[1]

The velocity of flow is best determined by the current meter, which is a form of water wheel actuated by the current, and of such size and shape that it can easily be placed at any point in the stream.

The new type of penta-recording current meter consists of six cups attached to a vertical shaft which revolves on a conical hardened-steel point when immersed in moving water. The revolutions are indicated electrically or acoustically. The rating, or relation between the velocity of moving water and the revolutions of the wheel, is determined for each meter by drawing it through still water for a given distance at different speeds and noting the number of revolu-

[1] Further information regarding the float method is given in Water-Supply Paper 95 and in textbooks on stream flow.

tions for each run. From these data a rating table is prepared which gives the velocity in feet per second of moving water for any number of revolutions in a given time interval. The ratio of revolutions per second to velocity of flow in feet per second is very nearly a constant for all speeds and is approximately 0.45.

Three classes of methods of measuring velocity with current meters are in general use—multiple-point, single-point, and integration.

The two principal multiple-point methods in general use are the vertical velocity curve and 0.2 and 0.8 depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually about 10 to 20 per cent of the depth apart. By plotting these velocities as abscissas and their depths as ordinates and drawing a smooth curve among the resulting points, the vertical velocity curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the area bounded by this velocity curve and its axis by the depth. This method of obtaining the mean velocity in the vertical is probably the best known, but on account of the length of time required to make a complete measurement its use is largely limited to the determination of coefficients for purposes of comparison.

In the second multiple-point method the meter is held successively at 0.2 and 0.8 depth, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. On the assumption that the vertical velocity curve is a common parabola with horizontal axis, the mean of velocities at 0.22 and 0.79 depth will give (closely) the mean velocity in the vertical. Actual observations under a wide range of conditions show that this multiple-point method gives the mean velocity very closely for open-water conditions and that in a completed measurement it seldom varies as much as 1 per cent from the value given by the vertical velocity-curve method. It is very extensively used in the regular practice of the United States Geological Survey.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined or must be assumed.

Extensive experiments by means of vertical velocity curves show that the thread of mean velocity generally occurs between 0.5 and 0.7 total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, and at this point the meter is held in most of the measurements made by the single-point method. A large number of vertical velocity curve measurements, taken on many streams and under varying conditions, show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean

velocity is practically unity. The variation of the coefficient from unity in individual cases is, however, greater than in the 0.2 and 0.8 method and the general results are not as satisfactory.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of the wind of other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be in general from about 0.85 to 0.95, depending on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is especially adapted for flood measurements, or for measurements when the velocity is so great that the meter can not be kept in the correct position for the other methods.

The vertical integration method consists in moving the meter at a slow but uniform speed from the surface to the bottom and back again to the surface and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods. In using the Price meter great care should be taken that the vertical movement of the meter is not rapid enough to vitiate the accuracy of the resulting velocity determination.

In practical work on rough streams, such as exist in Hawaii, the meter should be held at 0.6 depth for depths of 1 foot or less. For greater depths the meter should be held at two points in the vertical, 0.2 and 0.8 from the surface.

When the mean velocities in the different verticals have been found, the average of two adjacent means is taken as the mean velocity for that individual section. The area of the section is computed by multiplying the width of the section by the mean depth. The discharge of each section is then the product of the area multiplied by the mean velocity, and the total discharge of the stream results from summing up the discharge of the individual sections. In practice the work is tabulated in such a way as to render the computation very simple.[1]

Current meter measurements are not practicable where there are eddies, cross currents, swirls, or passages for the water underneath stones. It is usually possible, however, to improve the channel by removing bowlders and rocks, so that a satisfactory measuring section may be obtained, even on rough, steep streams such as exist in Hawaii.

Three kinds of velocity-area gaging stations are in general use in Hawaii, according to the means provided for making the observations of depth and velocity. They are wading, bridge, and cable stations.

[1] For a discussion of methods of computing the discharge of a stream see Engineering News, June 25, 1908.

A wading station is one at which measurements are made only by wading; that is, no means exist for getting above the water at any stage except by wading. Such stations are usually on ditches or wide, shallow streams, which do not fluctuate greatly in flow. Frequently, however, measurements are made at low stages by wading, even though other means exist for making measurements at higher stages.

A bridge station is one at which the meter is used from a bridge. In some places highway or other bridges are available from which to make measurements, but generally they are not at the right place on the stream. Special bridges are then built.

A cable station is one at which measurements are made from a cable spanning the stream. Cable stations are used on large streams, such as Hanapepe, Wailua, and Hanalei rivers on the island of Kauai, and Wailuku River on the island of Hawaii. The cable supports the car from which a man works above the water. Distances are marked off on the cable itself or on a small auxiliary cable stretched taut above it.

A suitable place for a gaging station having been selected, a staff gage is set in the edge of the stream, either vertical or inclined, but graduated into tenths, half-tenths, or hundredths of feet vertically. The gage is securely fastened to rocks or trees to prevent displacement by floods and is so placed that the zero, or reference datum, is well below extreme low water. The datum is also referred to a permanent bench mark as an additional precaution. A water-stage recorder is then installed or an observer is engaged to record the heights of water morning and evening, and the mean of the two readings is used as the mean gage height for the day. Owing to the rapid rise and fall of most of the streams in Hawaii, two gage-height readings a day will not as a rule give a true mean for the 24 hours. For this reason, and also owing to the fact that many of the gaging stations are necessarily situated in the mountains at points remote from all habitations and difficult of access, it has generally been found necessary to use water-stage recorders. These instruments are of various types, some requiring weekly visits and others operating for a month without attention.

The essential features of water-stage recorders comprise a float free to rise and fall with fluctuations of the water surface, a device for transferring the motion of the float to the record sheet (either directly or through a reducing mechanism), the recording device, and the clock. The instruments may be designed for any range of stage. Those used by the United States Geological Survey in Hawaii are designed for ranges up to as high as 36 feet, but so far those having a 20-foot range have been found to be sufficient for any stage.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated more or less definitely with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as "second-feet"; "gallons per minute," "gallons per 24 hours," "miner's inches," and "run-off in second-feet per square mile," and (2) those which represent the actual quantity of water, as "run-off in depth in inches," "million gallons," and "acre-feet." They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the unit for the rate of discharge of water flowing in a stream 1 square foot in cross section at a rate of 1 foot per second. It is generally adopted as the fundamental unit in the measurement of flowing water and is the "natural" unit, as the foot and the second are the units used in making the physical determinations. Other units may be computed from this by the use of factors given in the table of equivalents.

"Gallons per minute" is generally used in connection with pumping and city water supply, the United States gallon of 231 cubic inches being the unit of quantity and 1 minute the unit of time.

The "miner's inch" is the unit for the rate of discharge of water that passes through an orifice 1 inch square under a head which varies locally. It is commonly used by miners and irrigators throughout the West, and is defined by statutes in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

In the Territory of Hawaii a unit commonly used in connection with the measurement of water is the "million gallons." This is used with two meanings—(1) to indicate a rate of flow and (2) to express an actual quantity of water. In the former sense "million gallons per 24 hours" is inferred, 1,000,000 gallons being taken as the unit of quantity and 24 hours as the unit of time. With this meaning the term is generally used in connection with pumping and irrigation. In the

latter sense "million gallons" as an absolute quantity is used in the measurement of storage capacities of reservoirs.

The following convenient approximate relations exist between second-feet, million gallons per 24 hours, and acre-feet: 1 second-foot flowing 24 hours equals about 2 acre-feet; 1,000,000 gallons equals about 3 acre-feet; and 1 second-foot equals approximately two-thirds million gallons per 24 hours.

"Man's water" is an irrigator's terms also in common use in Hawaii. It signifies the amount of water that one irrigator can properly handle in the field. It varies greatly, being dependent upon the condition of the furrows, the age of the crop, and the skill and individuality of the irrigator.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting discharge in second-feet into run-off in acre-feet.

Discharge (second-feet).	Run-off (acre-feet).				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	1.983	55.54	57.52	59.50	61.49
2	3.967	111.1	115.0	119.0	123.0
3	5.950	166.6	172.6	178.5	184.5
4	7.934	222.1	230.1	238.0	246.0
5	9.917	277.7	287.6	297.5	307.4
6	11.90	333.2	345.1	357.0	368.9
7	13.88	388.8	402.6	416.5	430.4
8	15.87	444.3	460.2	476.0	491.9
9	17.85	499.8	517.7	535.5	553.4

NOTE.—For part of a month multiply values for one day by the number of days.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year (365 days) covers 1 square mile 1.131 feet or 13.572 inches deep.

1 second-foot for one year (365 days) equals 31,536,000 cubic feet.

1 second-foot for one year (365 days) equals 724 acre-feet.

1 second-foot equals about 1 acre-inch per hour.

1 second-foot for one day covers 1 square mile 0.03719 inch deep.

1 second-foot for one day equals 1.983 acre-feet.

1,000,000 United States gallons per day equals 1.55 second-feet.

1,000,000 United States gallons equal 3.07 acre-feet.

1,000,000 cubic feet equals 22.95 acre-feet.

1 acre-foot equals 325,850 gallons.

1 inch deep on 1 square mile equals 2,323,200 cubic feet.

1 inch deep on 1 square mile equals 0.0737 second-foot per year.

1 foot equals 0.3048 meter.

1 mile equals 1.60935 kilometers.

1 mile equals 5,280 feet.

1 acre equals 0.4047 hectare.

1 acre equals 43,560 square feet.

1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1⅓ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

OFFICE METHODS OF COMPUTING AND STUDYING DISCHARGE AND RUN-OFF.

At the end of each year the field or base data for current-meter gaging stations, consisting of water-stage record sheets, daily gage heights, discharge measurements, and notes from observers' books are assembled. The measurements are plotted on cross-section paper and rating curves are drawn wherever feasible. The rating tables prepared from these curves are then applied to the tables of daily gage heights to obtain the daily discharge, and from these applications the tables of monthly discharge and run-off are computed.

Rating curves are drawn and studied with special reference to the class of channels which they represent. The discharge measurements for all classes of stations, when plotted with gage heights in feet as ordinates and discharges in second-feet as abscissas, define rating curves which are generally more or less parabolic in form. For many stations curves of area in square feet and mean velocity in feet per second are also constructed to the same scale of ordinates as the discharge curve. These are used mainly to extend the discharge curves beyond the limits of the plotted discharge measurements, to check the form of the discharge curve, and to determine and eliminate erroneous measurements.

For every rating table the following assumptions are made for the period of application of the table: (*a*) That the discharge is a function of and increases gradually with the stage; (*b*) that the discharge is the same whenever the stream is at a given stage, and hence such changes in conditions of flow as may have occurred during the period of application are either compensating or negligible, except that the rating, as stated in the footnote of each table, is not applicable for periods during which the channel was obstructed; (*c*) that the increased and decreased discharge due to change of slope on rising and falling stages is either negligible or compensating.

As already stated, the gaging stations may be divided into several classes, as indicated in the following paragraphs:

The stations of class 1 represent the most favorable conditions for an accurate rating and are also the most economical to maintain. The bed of the stream is usually composed of rock and is not subject to the deposit of sediment and loose material. This class includes also many stations located in a pool below which is a permanent rocky riffle that controls the flow like a weir. Provided the control is sufficiently high and close to the gage to prevent cut and fill at the gaging point from materially affecting the slope of the water surface, the gage height will for all practical purposes be a true index of the discharge. Discharge measurements made at such stations usually plot within 2 or 3 per cent of the mean discharge curve, and the rating developed from that curve represents a very high degree of accuracy.

Class 2 comprises mainly stations on rough, mountainous streams with steep slopes. The beds of such streams are, as a rule, comparatively permanent during low and medium stages, and when the flow is sufficiently well defined by an adequate number of discharge measurements before and after each flood the stations of this class give nearly as good results as those of class 1. As it is seldom possible to make measurements covering the time of change at flood stage, the assumption is often made that the curves before and after the flood converged to a common point at the highest gage height recorded during the flood. Hence the only uncertain period occurs during the period of actual change in conditions of flow.

Class 3 includes those stations where the stream bed is of a shifting character, or the controlling section below the gage frequently changes owing to cutting out by the current and the filling in of sand, gravel, and drift. In some cases in Hawaii changes are caused by the growth of vegetation in the stream bed. No absolute rule can be laid down for stations of this class. Each rating curve must be constructed mainly on the basis of the measurements of the current year, the engineer being guided largely by the history of the station and the following general law: If all measurements ever made at a station of this class are plotted on cross-section paper, they will define a mean curve which may be called a standard curve. It has been found in practice that if after a change caused by high stage a relatively constant condition of flow occurs at medium and low stages, all measurements made after the change will plot on a smooth curve which is practically parallel to the standard curve with respect to ordinates or gage heights. This law of the parallelism of rating curves is the fundamental basis of all ratings and estimates at stations with semipermanent and shifting channels. It is not absolutely correct, but, with few exceptions, answers all the practical requirements

of estimates made at low and medium stages after a change at a high stage. This law appears to hold equally true whether the change occurs at the measuring section or at some controlling point below. The change is, of course, fundamentally due to change in the channel caused by cut or fill, or both, at or near the measuring section. For all except small streams the changes in section usually occur at the bottom. The following simple but typical examples illustrate this law:

(*a*) If 0.5 foot of planking were to be nailed on the bottom of a well-rated wooden flume of rectangular section, there would result, other conditions of flow being equal, new curves of discharge, area, and velocity, each plotting 0.5 foot above the original curves when referred to the original gage. In other words, this condition would be analogous to a uniform fill or cut in a river channel which either reduces or increases all three values of discharge, area, and velocity for any gage height. In practice, however, such ideal conditions rarely exist.

(*b*) In the case of a cut or fill at the measuring section, there is a marked tendency toward decrease or increase, respectively, of the velocity. In other words, the velocity has a compensating effect, and if the compensation is exact at all stages the discharge at a given stage will be the same under both the new and the old conditions.

(*c*) In the case of uniform change along the crest of a weir or rocky control, the area curve will remain the same as before the change, and it can be shown that here again the change in velocity curve is such that it will produce a new discharge curve essentially parallel to the original discharge curve with respect to their ordinates.

Of course, in actual practice such simple changes of section do not occur. The changes are complicated and lack uniformity, a cut at one place being largely offset by a fill at another, and vice versa. If these changes are very radical and involve large percentages of the total area—as, for example, on small streams—there may result a wide departure from the law of parallelism of rating curves. In complicated changes of section the corresponding changes in velocity which tend to produce a new parallel discharge curve may interfere with each other materially, causing eddies, boils, backwater, and radical changes in slope. In such extreme conditions, however, the measuring section would more properly fall under class 4 and would require very frequent measurements of discharge. Special stress is laid on the fact that in the lack of other data to the contrary the utilization of this law will yield the most probable results.

Slight changes at low or medium stages of an oscillating character are usually averaged by a mean curve drawn among them parallel to the standard curve, and if the individual measurements do not

vary more than 5 per cent from the rating curve the results are considered good for stations of this class.

Class 4 comprises stations on streams that have soft, muddy, or sandy beds. Good results can be obtained from such sections only by frequent discharge measurements, the frequency ranging from a measurement every two or three weeks to a measurement every day, according to the rate of diurnal change in conditions of flow. These measurements are plotted and a mean or standard curve drawn among them. It is assumed that there is a different rating curve for every day of the year and that this rating is parallel to the standard curve with respect to their ordinates. On the day of a measurement the rating curve for that day passes through that measurement. For days between successive measurements it is assumed that the rate of change is uniform, and hence the ratings for the intervening days are equally spaced between the ratings passing through the two measurements. This method must be modified or abandoned altogether under special conditions. Personal judgment and a knowledge of the conditions involved can alone dictate the course to pursue in such cases.

The computations have, as a rule, been carried to three significant figures. Computation machines and the 20-inch slide rule have been generally used. All computations are carefully checked.

After the computations have been completed they are entered in tables and carefully studied and intercompared to eliminate or account for all gross errors so far as possible. Missing periods are filled in, so far as feasible, by means of comparison with records for adjacent streams. The attempt is made to complete years or periods of discharge, thus eliminating fragmentary and disjointed records. Full notes accompanying such estimates follow the daily and monthly discharge tables.

EXPLANATION OF TABLES.

For each regular current-meter gaging station are given in general the following data: Description of station, list of discharge measurements, table of daily discharge, table of monthly and yearly discharge, and run-off in acre-feet.

All rates of flow are expressed as second-feet, because distances and depths are measured in feet, and velocities in feet per second. The flow is thus obtained in cubic feet per second, or more briefly in "second-feet." The term "million gallons per 24 hours" is not used except in a few tables where data have been furnished in these units by private cooperations. "Million gallons per 24 hours" is not a primary but a derived unit. To convert second-feet into million gallons per 24 hours multiply by 0.646.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as shifting channels and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, gage height, and discharge in second-feet.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

The table of daily discharge gives the discharge in second-feet corresponding to the observed gage height as determined from the rating table, the number of significant figures used varying with the size of the discharge.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" gives the average flow in cubic feet for each second during the month. The "run-off in acre-feet" given in the column under that head is computed from the mean discharge in second-feet.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends (1) on permanence of the relation between discharge and stage, and (2) on the accuracy of observations of stage, measurements of discharge, and interpretation of data.

The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, the number of gage readings per day, the range of the fluctuation in stage, and knowledge of local conditions. In this column, A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published.

DIVISION OF WORK.

On account of the isolation of the different islands of the Territory an engineer or employee was assigned to take charge of the field work on each of the four largest islands, with temporary headquarters on those islands.

Persons in charge of field work.

Island.	In charge.	Headquarters.
Oahu	G. K. Larrison, district engineer	Honolulu (permanent).
	J. C. Dort, assistant engineer	Do.
Kauai	W. V. Hardy, field assistant	Waimea (temporary).
Maui	C. T. Bailey, assistant engineer	Wailuku (temporary).
Hawaii	E. O. Christiansen, assistant engineer	Hilo [a] (temporary).

[a] Discontinued July 18, 1913.

The ratings, applications, and computations were made by J. C. Dort, C. T. Bailey, W. V. Hardy, E. O. Christiansen, Howard Kimble, H. A. R. Austin, E. E. Goo, G. R. White, John Kaheaku, S. W. Dort, H. M. Kennedy, and R. M. S. Goo. The report was edited by Mrs. B. D. Wood.

GAGING STATIONS MAINTAINED IN HAWAII.

The following list comprises the gaging stations maintained in Hawaii by the United States Geological Survey and cooperative parties. The stations are arranged by stream basins and appear in systematic order for the several islands, tributaries of main streams being indicated by indention. The date refers to the years or parts of years for which records are available. A dash following the date indicates that the station was being maintained December 31, 1913.

KAUAI ISLAND.

Waimea River near Waimea, 1910–
- Poomau River:
  - Kawaikoi Stream near Waimea, 1909–
    - Waiakoali Stream near Waimea, 1909–1912.
  - Mohihi Stream near Waimea, 1909–1912.
- Waialae River near Waimea, 1910–
- Kekaha ditch at Weir, Camp No. 1, near Waimea, 1910–1912.
- Kekaha ditch at flume No. 3, near Waimea, 1910–1912.
- Kekaha ditch at siphon, near Waimea, 1910–1912.
- Kekaha ditch at tunnel No. 12 weir, near Waimea, 1910–1912.
- Waimea ditch near Waimea, 1911–1913.
- Kamenehune ditch near Waimea, 1911–12.
- Makaweli River near Waimea, 1911–
  - Halekua Stream near Waimea, 1912–13.
  - Olokele River:
    - Olokele ditch at tunnel No. 12, near Makaweli, 1904–
    - Olokele ditch near Makaweli, 1912–
  - Poowaiomahaihai ditch near Waimea, 1911–1913.

Hanapepe River above Hanapepe Falls, near Eleele, 1911–12.
Hanapepe River at Koula, near Eleele, 1910–
Hiloa ditch at Hanapepe Falls, near Eleele, 1911–
East Branch Hanapape River below Hanapepe Falls, near Eleele, 1911–12.
Hanapepe ditch below Hanapepe Falls, near Eleele, 1911–12.
Hanapepe ditch at Koula, near Eleele, 1910–
Hanapepe ditch at weir, near Hanapepe, 1910–
Huleia River near Lihue, 1912–
Hanamaulu River at Kapaia, near Lihue, 1911–
Wailua River:
South Fork of Wailua River at siphon, near Lihue, 1910–11.
South Fork of Wailua River above Waiehu Falls, near Lihue, 1911–
Hanamaulu ditch near Lihue, 1910–
Lihue ditch near Lihue, 1910–
North Fork of Wailua River near Lihue, 1910–
Kanaha ditch near Lihue, 1910–
East Branch of North Fork of Wailua River, near Lihue, 1912–
Uhau Iole Stream at 750-foot elevation, near Lihue, 1912.
Keahua Stream at 750-foot elevation, near Lihue, 1912.
Kawi Stream at 750-foot elevation, near Lihue, 1912.
Konohiki Stream at Makakualele weir (mauka), near Kapaa, 1911–
Kaehulua Stream at Kuhinoa (mule stable) weir, near Kapaa, 1911–1913.
South Fork of Kaehulua Stream at Wainamuamu weir, near Kapaa, 1911–12.
North Fork of Kaehulua Stream at Wainamuamu weir, near Kapaa, 1911–
Kapaa River, near Kealia, 1910–
Akulikuli Spring near Kealia, 1911–1913.
Kapahi ditch at Kapahi, near Kealia, 1909–
Tunnel ditch at Kapahi, near Kapaa, 1909–1911.
Kapaa ditch at Kapahi, near Kapaa, 1909–1911.
Pipe ditch at Kapahi, near Kapaa, 1909–1911.
Kealia Stream:
Kaneha ditch near Kealia, 1909–
Anahola River at 1,140-foot elevation, near Kealia, 1912.
Anahola River above dam at Kiokala, near Kealia, 1910. 1912–
Anahola River at Kiokala dam, near Kealia, 1910–1912.
Anahola ditch at Kiokala, near Kealia, 1909–
Anahola ditch at Makai weir, near Kealia, 1909–1911.
Kalihiwai River near Kilauea, 1912–
Hanalei River near Hanalei, 1911–
China ditch near Hanalei, 1911–12.
Kuna ditch near Hanalei, 1912–13.
Lumahai River near Wainiha, 1912.
Wainiha River, East Channel, near Wainiha, 1912–
Wainiha River, West Channel, near Wainiha, 1911–
Wainiha canal at intake, near Wainiha, 1910–1912.
Wainiha canal at tunnel No. 18, near Wainiha, 1911.
Wainiha canal at tailrace, near Wainiha, 1911.

OAHU ISLAND.

Kalihi Stream at Kioi pool near Honolulu, 1913–
Nuuanu Stream at Luakaha weir in upper Nuuanu Valley, near Honolulu, 1903, 1910–13.
Nuuanu Stream below Reservoir No. 2 wasteway, near Honolulu, 1913–

Nuuanu Stream at Kuakini Street, near Honolulu, 1911–12.
Lulumaha ditch at upper Nuuanu Reservoir, near Honolulu, 1911–1913.
Pauoa Stream at upper Pauoa Valley, near Honolulu, 1911–
Kahuawai Spring at upper Pauoa Valley, near Honolulu, 1912–
Manoa Stream at upper Manoa Valley, near Honolulu, 1910–1913.
Manoa Stream at College of Hawaii, near Honolulu, 1909–
West Branch of Manoa Stream at upper Manoa Valley, near Honolulu, 1913–
East Branch of Manoa Stream at upper Manoa Valley, near Honolulu, 1913–
Palolo Stream.
Pukele Stream at Mahoe springs, near Honolulu, 1912–
Waiomao Stream at upper Palolo Valley, near Honolulu, 1911–13.
Waiomao Stream above Pukele, near Honolulu, 1911–12.
Waimanalo ditch below main reservoir, near Waimanalo, 1912–13.
Pump ditch near Waimanalo, 1912.
Makawao ditch at Makawao flume, near Waimanalo, 1912–
Kailua Stream near Kailua, 1912–
Makawao Stream in Kailua Valley, near Kailua, 1912–
Kaimi Stream in Kailua Valley, near Kailua, 1912–
Kamakalepo Stream in Kailua Valley, near Kailua, 1912–
Pohakea Stream in Kailua Valley, near Kailua, 1912–
Kahanaiki Stream in Kailua Valley, near Kailua, 1912.
South Branch Kahanaiki Stream in Kailua Valley, near Kailua, 1913–
North Branch Kahanaiki Stream in Kailua Valley, near Kailua, 1913–
Kahanaiki ditch in Kailua Valley, near Kailua, 1912–13.
Waiahole Stream at Manianiaula, near Waikane, 1911–
Waiahole Stream at Waiahole, near Waikane, 1911–12.
Waihi Stream, near Waikane, 1911.
Halona Stream, near Waikane, 1911.
Waianu Stream, near Waikane, 1911.
Waikane Stream near Waikane, 1911–12.
Punaluu Stream near Hauula, 1906–7.
Kaluanui Stream near Hauula, 1906–7.
Kaipapau Stream near Hauula, 1906–7.
Kaukonahua Stream:
North Fork of Kaukonahua Stream near Wahiawa, 1911.
Right Branch of North Fork of Kaukonahua Stream near Wahiawa, 1913–
Left Branch of North Fork of Kaukonahua Stream near Wahiawa, 1913–
South Fork of Kaukonahua Stream near Wahiawa, 1911, 1913–
Wahiawa Reservoir ditch near Wahaiwa, 1910–11.

MAUI ISLAND.

West Maui.

Iao Stream near Wailuku, 1910–
Maniania ditch near Wailuku, 1909–1913.
Waiehu Stream:
South Waiehu Stream near Wailuku, 1910–
South Waiehu ditch near Wailuku, 1912–
North Waiehu Stream near Wailuku, 1912–
North Waiehu ditch near Wailuku, 1910–11.
Waihee Stream near Waihee, 1910–1912, 1913—
Waihee canal near Waihee, 1910–1912.
Waihee canal at weir, near Wailuku, 1911–12.
Spreckels ditch near Waihee, 1910–1913.
Spreckels ditch at Waiale weir, near Wailuku, 1910–11.

Kahakuloa Stream at Kahakuloa, near Waihee, 1912–13.
Kahakuloa Stream near Honokahau, 1913–
Honokahau Stream near Honokahau, 1913–
Honokahau ditch at intake, near Honokahau, 1907–1913.
Honokahau ditch above Honolua Stream, near Honokahau, 1910–11.
Honokahau ditch at Honokawai weir, near Lahaina, 1910–1912.
Honolua Stream at Honolua ranch, 1911.
Honolua Stream near Honokahau, 1913–
Honolua ditch near Honokahau, 1911–12.
Honokawai Stream near Lahaina, 1911; 1912–
Honokawai Stream at weir No. 1, near Lahaina, 1901.
Honokawai ditch near Lahaina, 1912–
Kahoma Stream near Lahaina, 1911–12.
Kahoma Stream at weir No. 1, near Lahaina, 1901.
Kahoma Stream at weir No. 2, near Lahaina, 1901.
Kahoma ditch at weir, near Lahaina, 1911–
Lahainaluna Stream near Lahaina, 1911–
Lahainaluna weir No. 1 near Lahaina, 1901.
Lahainaluna weir No. 2 near Lahaina, 1901.
Lahainaluna ditch near Lahaina, 1913–
Kauaula Stream near Lahaina, 1912.
Kauaula Stream at weir No. 3, near Lahaina, 1901.
Kauaula ditch near Lahaina, 1911–
Kauaula Stream, North Fork, at weir No. 1, near Lahaina, 1901.
Kauaula Stream, South Fork, at weir No. 2, near Lahaina, 1901.
Launiupoko Stream near Lahaina, 1911–
Olowalu Stream near Olowalu, 1913.
Olowalu ditch No. 1 near Olowalu, 1911–
Ukumehame Stream near Olowalu, 1911–12.
Waikapu Stream near Waikapu, 1910–
Palolo (Everett) ditch near Waikapu, 1910–
South Side Waikapu ditch near Waikapu, 1910–

East Maui.

Koolau Ditch region:
Koolau ditch near Keanae, 1910–1912.
Koolau ditch at Alo division weir, near Huelo, 1908–1911.
Spreckels ditch region:
Haipuaena Stream near Huelo, 1910–.
Puohakamoa Stream near Huelo, 1910–.
Alo Stream near Huelo, 1910–.
Waikamoi Stream near Huelo, 1910–.
Oopuola Stream near Huelo, 1910–.
Spreckels ditch at station No. 1, near Huelo, 1910–1913.
Spreckels ditch at station No. 2, near Huelo, 1911–1913.
Spreckels ditch at station No. 3, near Huelo, 1910–1913.
Spreckels ditch at station No. 4, near Huelo, 1910–1913.
Spreckels ditch at station No. 5, near Huelo, 1911–1913.
Spreckels ditch at station No. 6, near Huelo, 1911–1913.
Spreckels ditch at station No. 7, near Huelo, 1911–12.
Spreckels ditch at station No. 8, near Huelo, 1911–1913.
Center ditch region:
Center ditch near Huelo, 1910–1912.

Hamakua ditch region:
- Nailiilihaele Stream near Huelo, 1910–1912; 1913–
- Kailua Stream near Huelo, 1910–1912; 1913–
- Oanui Stream near Huelo, 1910–11; 1913–
- Hoolawaliilii Stream near Huelo, 1911–
- Hoolawanui Stream near Huelo, 1911–
- Honopou Stream near Huelo, 1910–
- Halehaku Stream at dam, near Huelo, 1910–11.
- Halehaku Stream weir near Huelo, 1910–1912.
- Opana Stream near Huelo, 1910–1912.
- Opana ditch near Huelo, 1910–1912.
- New Hamakua ditch at Nailiilihaele weir, near Huelo, 1910–1912.
- New Hamakua ditch at Halehaku weir, near Huelo, 1910–1912.
- New Hamakua ditch at station No. 1, near Huelo, 1912.
- New Hamakua ditch at station No. 2, near Huelo, 1912.
- New Hamakua ditch at station No. 3, near Huelo, 1912.
- New Hamakua ditch at station No. 4, near Huelo, 1912.
- New Hamakua ditch at station No. 5, near Huelo, 1912.
- Old Hamakua ditch at Opana weir, near Huelo, 1910–1912.
- Kaluanui ditch at Puuomalei, near Hamakuapoko, 1910–1912.
- Lowrie ditch at Opana weir, near Huelo, 1910–1912.
- Haiku ditch at Peahi weir, near Huelo, 1910–1912.

HAWAII ISLAND.

Hilo group:
- 81 stations at 2,700 feet elevation, in forest back of Hilo, 1911–1913.
- Wailuku River near Hilo, 1911–1913.
- Honolii River at Kaiwiki, near Hilo, 1911–1913.
- Honolii ditch at Kaiwiki, near Hilo, 1911.
- Kawainui River at Kawainui, near Pepeekeo, 1911–12.
- 4 stations at Piihonua, near Hilo, 1912.

Hamakua group:
- Waipio River below Koiawe, near Waipio, 1911–12.
- Waipio River below Waima, near Waipio, 1911–12.
- Waipio River at 360 feet elevation, near Waipio, 1901–2.
  - New Hamakua ditch at Waima Stream, near Waipio, 1912.
  - New Hamakua ditch at main weir, near Kukiuhaele, 1910–
  - Hamakua ditch at main weir, at Puualala, Waimea, 1913.
  - Kawainui Branch of Waipio River, near Waipio, 1911–12.
  - Kawainui Stream at 2,120 feet elevation, near Waipio, 1901–2.
  - Kawainui Stream at 1,435 feet elevation, near Waipio, 1901–2.
  - Kawainui Stream at 775 feet elevation, near Waipio, 1901–2.
    - Branch No. 3 of Kawainui Stream at 1,700 feet elevation, near Waipio, 1901–2.
    - Branch No. 2 of Kawainui Stream at 1,405 feet elevation, near Waipio, 1901–2.
    - Branch No. 1 of Kawainui Stream at 1,380 feet elevation, near Waipio, 1901–2.
  - Alakahi Stream at 1,200 feet elevation, near Waipio, 1901–2.
  - Alakahi Stream at 730 feet elevation, near Waipio, 1901–2.
  - Koiawe Stream at 1,120 feet elevation, near Waipio, 1901–2.
  - Koiawe Stream at 610 feet elevation, near Waipio, 1901–2.
  - Waima Stream at 790 feet elevation, near Waipio, 1901–2.
  - Waima Stream at 385 feet elevation, near Waipio, 1901–2.

Kohala group:

Honokane Stream:

East Branch of Honokane Stream at 1,300 feet elevation, near Honokane, 1901.
East Branch of Honokane Stream at 770 feet elevation, near Honokane, 1901.
West Branch of Honokane Stream at 1,370 feet elevation, near Honokane, 1901.
West Branch of Honokane Stream at 775 feet elevation, near Honokane, 1901.
Kohala ditch near Kohala, 1901–1913.
Kehana ditch at Honokane Mauka, near North Kohala, 1912–13.

GAGING-STATION RECORDS.

ISLAND OF KAUAI.

WAIMEA RIVER NEAR WAIMEA, KAUAI.

Location.—About 2 miles north of Waimea, 250 feet above ford.
Records available.—July 9, 1910, to December 31, 1913.
Drainage area.—58 square miles.
Gage.—Vertical and inclined staff.
Control.—Shifting.
Discharge measurements.—Made from wire suspension bridge or by wading.
Diversion.—Greater part of low-water flow diverted by irrigation ditches above station.
Accuracy.—Records good except for November and December, when fair results were obtained.

Daily discharge, in second-feet, of Waimea River near Waimea, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.2	6.6	3.2	0.2	12	1.0	34	1.6	373	0.6	283	0.6
2	192	2.2	2.2	42	2.2	1.0	397	1.4	38	.6	246	.4
3	47	2.2	3.2	14	2.2	186	184	1.1	24	.6	182	.4
4	7.3	2.2	2.2	2.2	1.6	12	572	1.0	20	65	6.6	.2
5	2.4	2.2	1.6	1.0	1.0	4.1	545	1.7	76	60	4.1	.2
6	2.2	2.2	.6	1.0	1.0	4.1	165	1.6	3.3	57	2.8	.2
7	2.2	2.2	.2	1.0	.2	2.2	151	1.7	1.5	1.8	2.2	.2
8	2.1	212	.2	.2	.2	2.2	20	1.4	1.2	3,340	2.1	.1
9	24	5.4	3.2	4.1	.2	1.0	2.2	1.4	1.0	320	2.1	.1
10	6.1	2.2	2.2	8.3	.1	1,490	2.1	1.6	.9	277	1.8	.1
11	186	255	1.0	815	.1	357	1.8	1.6	.8	264	6.6	80
12	6.6	432	1.0	540	3,340	102	1.5	1.5	.8	78	10,000	397
13	489	2.2	.2	320	2,190	47	47	6.6	.8	74	10,000	255
14	4.8	2.2	.2	226	780	10	1,150	2.2	1.0	69	9,300	240
15	6.6	2.2	.2	320	226	4.1	182	17	.9	65	9,000	226
16	30	2.2	.2	5.4	47	2.2	67	3.0	.9	53	8,900	221
17	4.4	2.2	1.0	.1	5.4	2.2	.....	19	1.0	47	397	8.0
18	3.2	2.2	1.0	1.0	24	2.2	2.6	14	1.0	42	320	8.0
19	2.6	24	.6	1.0	2.2	3.3	2.2	2.1	3.5	41	306	8.3
20	441	2.2	.2	.2	2.2	2.1	81	1.5	3.2	38	300	6.4
21	6.9	6.6	1.6	255	1.0	1.7	4.1	1.6	1.2	36	296	6.4
22	5.8	4.1	1.0	212	1.0	1.1	3.3	1.6	2.8	540	286	6.4
23	2.2	2.2	.2	199	.2	1.0	2.1	1.4	2.2	1,310	58	5.8
24	2.1	357	1,940	94	.1	3.2	1.2	1.6	1.8	320	52	5.6
25	.4	111	996	47	4.1	1.7	1.1	3.2	1.7	277	49	5.4
26	2.2	30	270	27	4.1	115	2.1	1.8	1.7	258	47	5.1
27	2.2	6.6	47	12	2.2	34	2.2	1.6	640	76	42	4.6
28	2.2	2.2	22	1.0	1.0	21	2.0	1.5	165	72	38	3.5
29	2.2	.....	6.6	.2	1.0	3.9	1.7	189	158	68	.8	2.8
30	2.1	.....	1.0	.2	1.0	2.4	1.8	62	29	3.5	.8	2.2
31	140	.....	1.0	.....	1.0	.....	1.7	174	.....	3.3	.....	1.6

NOTE.—No discharge July 17.

Monthly discharge of Waimea River near Waimea, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	489	0.4	52.6	3,230	A.
February	432	2.2	53.1	2,950	A.
March	1,940	.2	50.5	3,110	A
April	815	.1	105	6,250	A.
May	3,340	.1	215	13,200	A.
June	1,490	1.0	80.7	4,800	A.
July	1,150	(a)	117	7,190	A.
August	189	1.0	16.8	1,030	A.
September	640	.8	51.9	3,090	A.
October	3,340	.6	254	15,600	A.
November	10,000	.8	1,670	99,400	B.
December	397	.1	48.4	2,980	B.
The year	10,000	(a)	225	163,000	

a Channel dry.

KAWAIKOI STREAM NEAR WAIMEA, KAUAI.

Location.—8 miles northeast of Knudsen's mountain house, and about 27 miles north of Waimea by horse trail.

Records available.—April 3, 1909, to December 31, 1913.

Drainage area.—4.1 square miles.

Gage.—Barrett & Lawrence water-stage recorder.

Control.—Probably permanent.

Discharge measurements.—Made from a wire suspension bridge or by wading.

Accuracy.—Records good.

Discharge measurements of Kawaikoi Stream near Waimea, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 8	D. E. Horner	1.86	12.6	June 5	D. E. Horner	2.28	44.4
May 5	W. V. Hardy	1.80	8.44	July 7	W. V. Hardy	2.68	50.3
June 4	D. E. Horner	3.49	123				

Daily discharge, in second-feet, of Kawaikoi Stream near Waimea, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	.....	13	14	9	34	8	4.5	26
2	.....	.....	.....	.....	.....	23	14	8	25	7	69	20
3	.....	.....	10	.....	.....	20	13	8	16	4.5	55	31
4	18	.....	9	.....	.....	68	20	7	8	4	16	80
5	14	.....	.....	.....	9	23	24	7	8	4	12	110
6	14	.....	.....	.....	16	16	23	7	8	4	9	127
7	15	15	.....	.....	23	16	47	11	8	74	82	53
8	.....	32	.....	.....	15	14	22	20	8	82	27	50
9	.....	.....	.....	.....	12	13	17	20	7	18	24	31
10	.....	.....	.....	.....	10	13	14	12	7	13	17	21
11	.....	.....	.....	.....	63	13	13	9	7	12	80	18
12	.....	.....	.....	.....	68	13	30	18	9	10	119	17
13	.....	.....	.....	.....	53	13	114	22	9	7	68	16
14	.....	.....	.....	.....	16	13	63	39	14	7	21	15
15	.....	.....	.....	.....	14	14	22	30	10	7	15	15
16	.....	.....	.....	.....	16	15	17	98	8	6	66	15
17	.....	.....	.....	.....	55	14	15	26	7	5	109	14
18	.....	.....	.....	.....	36	14	13	18	30	5	82	14
19	.....	.....	.....	.....	15	12	18	11	17	5	190	13
20	.....	.....	.....	.....	13	11	33	9	10	5	75	12
21	.....	.....	.....	.....	11	12	20	8	11	5	31	11
22	.....	.....	.....	.....	10	12	15	7	14	5	92	11
23	.....	.....	.....	.....	8	12	13	7	8	6.5	152	11
24	.....	.....	.....	.....	8	12	14	28	4.5	12	172	10
25	.....	.....	.....	.....	8	12	16	18	6	18	100	10
26	.....	.....	.....	.....	8	12	14	19	5	12	44	9
27	.....	.....	.....	.....	8	12	12	18	4.5	11	31	8
28	.....	.....	.....	.....	8	12	9	13	5	7	24	8
29	.....	.....	.....	.....	8	14	9	22	5	5	28	9
30	.....	.....	.....	.....	8	14	9	20	4	4.5	36	9
31	.....	.....	.....	.....	8	.....	9	36	.....	4.5	.....	11

NOTE.—No records Jan. 1–3, Jan. 8 to Feb. 6, Feb. 9 to Mar. 2, and Mar. 5 to May 4.

Monthly discharge of Kawaikoi Stream near Waimea, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 4–31	.....	.....	19.5	1,040	A.
June	68	11	15.8	940	A.
July	114	9	22.1	1,360	A.
August	98	7	18.9	1,160	A.
September	34	4	10.6	631	A.
October	82	4	12.2	750	A.
November	190	4.5	61.7	3,670	A.
December	127	8	26.0	1,600	A.
The period	.....	.....	.....	11,200	

WAIALAE RIVER NEAR WAIMEA, KAUAI.

Location.—3 miles northeast of F. Gay's mountain house, and about 20 miles northeast of Waimea by horse trail.

Records available.—August 1, 1910, to December 31, 1913.

Drainage area.—3.5 square miles.

Gage.—Barrett & Lawrence water-stage recorder.

Control.—Probaby permanent.

Discharge measurements.—Made from cable or by wading.

Accuracy.—Records January to August, good; September to December, fair.

Discharge measurements of Waialae River near Waimea, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	D. E. Horner	1.56	28.9	June 9	D. E. Horner	1.64	35.9
May 9	do	1.22	8.83				

Daily discharge, in second-feet, of Waialae River near Waimea, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.2	3.5	8.0	39	26	7.2	24	6.9	30	5.5	7.6	18
2	7.2	3.6	8.0	21	23	6.9	50	6.3	41	5.2	8.0	11
3	7.2	3.9	7.6	11	38	8.3	44	6.0	31	4.3	30	10
4	7.2	4.3	7.6	10	21	14	39	6.0	13	4.3	11	13
5	7.2	4.3	7.6	7.6	16	11	50	5.5	11	4.3	9.9	23
6	7.2	4.3	7.6	6.9	15	11	31	5.8	11	4.3	9.9	48
7	7.2	5.5	7.2	6.6	12	11	24	6.3	11	5.8	14	15
8	43	34	6.6	6.3	11	9.1	24	6.9	10	105	16	10
9	20	16	5.5	9.1	7.6	8.7	17	7.2	7.2	26	41	8.0
10	50	18	5.5	24	7.2	36	11	7.2	7.2	11	26	8.0
11	50	36	4.2	34	24	41	9.1	7.2	6.0	10	108	7.2
12	16	16	3.0	20	100	17	8.0	7.2	5.8	9.1	122	7.2
13	122	11	3.0	84	70	15	8.0	10	5.8	57	126	7.2
14	34	9.5	3.0	51	29	23	14	15	5.8	36	24	6.3
15	27	9.1	3.0	93	18	12	13	17	5.8	26	21	4.9
16	32	8.3	3.0	30	17	11	9.9	24	5.8	20	23	4.3
17	13	8.0	3.0	36	16	8.3	8.3	17	5.8	15	24	4.3
18	9.5	8.0	4.0	44	16	7.6	8.0	16	5.8	14	17	5.5
19	8.0	8.0	4.0	34	16	7.2	8.3	10	5.8	26	70	5.5
20	7.6	8.0	7.2	20	13	7.2	8.3	8.0	5.8	19	63	5.5
21	7.2	8.0	7.6	18	11	7.2	9.1	7.6	5.8	16	18	5.8
22	6.9	8.0	17	16	10	7.2	7.6	7.2	5.5	17	25	5.2
23	6.6	7.2	15	16	8.0	6.9	7.2	7.2	5.5	31	60	4.9
24	6.0	39	54	16	7.6	6.3	7.2	6.6	5.2	23	58	4.9
25	5.8	20	62	51	7.2	6.3	7.2	6.9	4.9	30	61	5.5
26	5.8	16	41	28	7.2	30	7.2	6.6	4.3	22	43	5.5
27	5.2	11	14	18	7.2	17	7.2	6.3	4.0	28	11	5.2
28	4.2	9.1	11	18	7.2	18	7.2	17	6.0	14	18	5.8
29	3.8	.....	7.2	45	7.2	14	7.2	68	5.5	13	50	6.3
30	3.5	.....	6.3	41	7.2	9.1	7.2	18	5.5	11	72	6.3
31	3.5	.....	6.3	.....	7.2	.....	6.9	32	.....	8.0	.....	6.6

Monthly discharge of Waialae River near Waimea, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	122	3.5	17.5	1,080	A.
February	39	3.5	12.1	672	A.
March	62	3.0	11.3	695	A.
April	93	6.3	28.5	1,700	A.
May	100	7.2	18.8	1,160	A.
June	41	6.3	13.2	786	A.
July	50	6.9	15.8	972	A.
August	68	5.5	12.2	750	A.
September	41	4.0	9.43	561	B.
October	105	4.3	20.0	1,230	B.
November	126	7.6	39.6	2,360	B.
December	48	4.3	9.16	563	B.
The year	126	3.0	17.3	12,500	

WAIMEA DITCH NEAR WAIMEA, KAUAI.

Location.—About 4 miles north of Waimea and 300 feet below intake.
Records available.—November 4, 1911, to September 30, 1913.
Gage.—Vertical staff.
Control.—Fairly permanent.
Discharge measurements.—Made from a footbridge.
Diversion.—Ditch diverts part of flow of Waimea River.
Accuracy.—Records poor.

Monthly discharge of Waimea ditch near Waimea, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	12.1	1.9	4.97	306	C.
February	15.3	1.5	4.21	234	C.
March	10.6	1.0	3.84	236	C.
April	27.5	2.4	7.93	472	C.
May	13.7	3.2	5.61	345	C.
June	16.1	2.4	6.25	372	C.
July	16.1	1.5	7.16	440	C.
August	15.3	2.0	4.73	291	C.
September	12.1	1.7	4.02	239	C.
The period				2,940	

MAKAWELI RIVER NEAR WAIMEA, KAUAI.

Location.—About 2 miles northeast of Waimea. Reached by wagon road up Makaweli River.
Records available.—October 6, 1911, to December 31, 1913.
Drainage area.—25.8 square miles.
Gage.—Vertical staff.
Control.—Probably slightly shifting.
Discharge measurements.—Made from a wire suspension footbridge or by wading.
Diversions.—Several above station.
Accuracy.—Records fairly good except for November and December, when they were poor.

The following discharge measurement was made by W. V. Hardy:
April 30, 1913: Gage height, 4.46 feet; discharge, 195 second-feet.

Daily discharge, in second-feet, of Makaweli River near Waimea, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	14	15	17	55	39	6	22	10	30	24	82	13
2	14	14	17	14	9	6	24	12	26	34	80	12
3	13	14	14	12	6	226	72	11	24	25	78	12
4	3	13	11	12	84	34	47	10	24	50	80	12
5	3	13	11	8	13	14	55	10	17	44	69	11
6	17	12	11	6	19	11	23	8	16	37	70	11
7	14	10	10	6	17	6	18	8	16	35	74	10
8	10	9	10	6	8	6	17	9	16	621	74	9
9	10	8	10	55	8	6	18	8	15	320	84	9
10	3	84	10	15	6	39	18	8	14	260	93	8
11	190	32	10	10	6	17	18	7	13	82	3,160	9
12	26	26	10	26	1,280	15	18	7	13	78	1,920	9
13	2,660	20	6	383	190	15	18	7	12	72	255	8
14	84	20	6	84	39	17	19	6	12	74	166	8
15	84	19	6	126	34	17	19	6	11	148	154	7
16	143	17	6	84	20	14	18	6	10	143	118	7
17	84	17	19	34	19	11	18	7	10	190	106	7
18	26	14	9	21	14	12	18	7	11	98	135	7
19	26	14	9	20	14	10	18	7	12	93	139	7
20	14	17	13	19	12	11	18	6	11	82	143	7
21	14	26	12	19	6	10	16	6	10	80	135	7
22	14	20	36	14	6	10	15	6	10	76	139	7
23	13	20	10	10	14	9	8	7	10	78	150	7
24	13	19	44	11	10	9	7	7	11	75	154	7
25	14	84	122	14	11	9	7	6	10	74	5,170	7
26	19	55	39	14	10	8	7	6	9	72	1,790	6
27	17	26	10	13	10	247	8	6	4	75	289	6
28	19	20	8	6	6	104	9	6	6	80	232	6
29	19	.....	6	122	6	16	7	6	6	80	202	2
30	17	.....	6	84	6	58	8	70	4	81	13	2
31	14	.....	6	.....	6	.....	8	74	.....	81	.....	2

Monthly discharge of Makaweli River near Waimea, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	2,660	3	116	7,130	B.
February	84	8	23.5	1,310	A.
March	122	6	16.6	1,020	B.
April	383	6	43.4	2,580	A.
May	1,280	6	62.2	3,820	B.
June	247	6	32.4	1,930	B.
July	72	7	19.2	1,180	A.
August	74	6	11.6	713	B.
September	30	4	13.1	780	B.
October	621	24	108	6,640	B.
November	5,170	13	512	30,500	C.
December	13	2	7.81	480	C.
The year	5,170	2	80.3	58,100	

HALEKUA STREAM NEAR WAIMEA, KAUAI.

Location.—Station is reached from Waimea via Gay's mountain house by saddle horse; requires two days to make round trip.

Records available.—October 11, 1912, to December 18, 1913.

Drainage area.—0.5 square mile.

Gage.—Barrett & Lawrence water-stage recorder.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Accuracy.—Records fair.

Cooperation.—Station maintained in cooperation with Hawaiian Sugar Co.

Discharge measurements of Halekua Stream near Waimea, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 10	D. E. Horner	3.90	10.8	Oct. 12	W. V. Hardy	3.50	1.68
Sept. 11	do	3.36	.65				

Daily discharge, in second-feet, of Halekua Stream near Waimea, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			2.2	7.8	3.8	2.2				1.0		
2			1.9	4.3	9.2	5.0						
3			1.9	4.5	4.2	4.7						19
4			1.9	3.3	3.5	3.0					1.5	1.4
5			1.9	3.0	3.3	2.9					1.5	3.0
6			2.0	2.7	3.3						2.3	2.7
7			2.0	2.6	3.3						3.3	1.4
8			1.8	3.3	3.0			2.5			5.0	1.2
9			1.6	5.5	2.6			2.7			5.0	.8
10			1.5	5.8	2.6			2.3			35	.8
11			1.4	4.0	20	8.9		2.0	0.8	2.9	53	.7
12		1.9	1.2	3.5	19	3.3		2.3	.8	2.0		.6
13		1.9	1.1	22	13	4.2		2.7	.8	9.2		.6
14		1.9	1.1	8.2	4.2	3.5		3.3		2.7		.6
15		1.8	1.2	11	5.8	3.3		3.0		1.5		.6
16		1.7	1.4	4.2	3.8	2.7		3.8		1.4		.6
17		1.7	1.7	6.0	3.6	2.5		1.9		1.4		.6
18		1.8	1.9	5.0	4.2	2.9		1.3		2.2		.6
19		1.8	2.5	5.8	2.9					1.7		
20		1.8	4.0	3.3	2.7		2.6			1.3		
21		1.9	3.3	3.3	2.6		2.6			1.0		
22		1.9	5.0	2.9	2.6		2.6			1.7		
23		4.2	7.5	3.3	2.5		2.3			1.9		
24		4.2	9.2	4.0	2.6		2.5			1.5		
25		3.0	12	8.6	2.6		2.5			3.0		
26		2.7	5.0	3.5	2.5		2.3					
27		2.6	4.3	3.3	2.5		2.2					
28		2.5	3.5	7.0	2.5		1.9		1.0			
29			3.2	7.5	2.5		2.0		.8			
30			2.9	6.0	2.5		2.0		.8			
31			9.2		2.5		1.9					

NOTE.—No record for days for which discharge measurements are not given.

OLOKELE DITCH AT TUNNEL NO. 12, NEAR MAKAWELI, KAUAI.

Location.[1]—About 10 miles northeast of Makaweli.
Records available.—July 24, 1904, to December 31, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from a plank across ditch.
Diversion.—Ditch diverts all low-water flow of Olokele River.
Accuracy.—Records excellent.
Cooperation.—Gage-height records furnished by Hawaiian Sugar Co.

Discharge measurements of Olokele ditch at tunnel 12, near Makaweli, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 27	W. V. Hardy	3.54	95.9	Apr. 27	W. V. Hardy	3.04	78.9
27	do	3.24	86.0	June 27	do	3.84	106

[1] Described in U. S. Geol. Survey Water-Supply Paper 336 as about "12 miles northeast of Waimea."

Daily discharge, in second-feet, of Olokele ditch at tunnel 12, Makaweli, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	64	51	51	105	81	51	105	51	91	55	47	38
2	55	51	51	101	105	47	105	58	72	51	51	61
3	51	51	51	75	97	41	105	51	72	47	88	64
4	51	47	51	72	81	41	105	51	61	47	61	68
5	51	51	51	64	61	41	105	47	61	44	68	68
6	47	51	51	58	55	105	78	47	72	105	105	105
7	51	97	55	55	68	84	88	64	61	75	51	68
8	101	78	55	51	94	61	68	78	55	105	88	55
9	91	55	51	55	64	91	61	97	68	105	101	55
10	101	51	51	68	58	105	55	55	55	68	94	51
11	101	88	47	97	51	97	55	55	51	61	105	51
12	101	58	47	64	88	64	51	51	68	68	61	51
13	101	55	47	105	105	94	105	78	51	105	105	51
14	101	51	47	101	78	78	72	84	51	94	101	51
15	91	51	47	105	64	94	72	68	51	84	105	51
16	91	58	55	84	68	101	64	58	55	97	105	55
17	72	51	94	105	64	58	58	58	51	58	105	47
18	61	51	61	97	97	55	55	55	51	55	75	51
19	58	72	72	101	61	75	58	51	51	64	105	51
20	55	55	97	75	55	55	64	51	47	51	105	51
21	58	68	91	72	51	97	55	105	47	51	94	47
22	58	0	75	68	51	55	61	58	55	51	78	51
23	57	61	64	64	51	68	55	55	47	61	78	47
24	55	101	97	72	51	72	68	51	47	51	105	47
25	54	72	101	105	58	75	105	101	47	64	105	47
26	52	55	97	84	58	105	105	72	47	58	105	47
27	51	44	68	68	51	72	81	58	47	58	105	47
28	51	55	78	64	64	75	61	68	55	68	75	47
29	51	.....	61	105	51	75	105	105	51	51	68	47
30	51	.....	58	101	97	105	58	105	47	47	22	47
31	58	.....	61	.....	55	.....	55	105	.....	47	.....	47

Monthly discharge of Olokele ditch at tunnel 12, near Makaweli, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	101	47	67.5	4,150	A.
February	101	0	58.2	3,230	A.
March	101	47	64.0	3,940	A.
April	105	51	81.4	4,840	A.
May	105	51	68.8	4,230	A.
June	105	41	74.6	4,440	A.
July	105	51	75.4	4,640	A.
August	105	47	67.5	4,150	A.
September	91	47	56.2	3,340	A.
October	105	44	66.0	4,060	A.
November	105	22	85.4	5,080	A.
December	105	38	53.7	3,300	A.
The year	105	0	68.2	49,400	

OLOKELE DITCH AT WEIR, NEAR MAKAWELI, KAUAI.[1]

Location.—About 7 miles northeast of Makaweli and about 3 miles below tunnel No. 12 on the same ditch.

Records available.—January 1, 1910, to December 31, 1913.

Gage.—Vertical staff; zero on gage is equal to crest of weir.

Discharge measurements.—Made from plank over ditch. Discharge computed by Francis formula for a 12-foot weir with end contractions; computations checked by current-meter measurements.

Diversion.—Ditch diverts all of low-water flow of Olokele River.

Accuracy.—Records good.

Cooperation.—Records are furnished by the Hawaiian Sugar Co.

Discharge measurements of Olokele ditch at weir, near Makaweli, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 14	W. V. Hardy	2.21	51.6
14	do	2.21	51.8

Daily discharge, in second-feet, of Olokele ditch at weir, near Makaweli, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	73.4	58.7	73.4	87.6	82.9	47.7	95.8	58.7	79.6	45.1	42.5	41.2
2	89.3	54.5	58.7	79.6	92.5	57.3	99.1	53.1	67.4	49.0	42.5	47.7
3	89.3	54.5	50.4	82.9	90.9	47.7	101	47.7	64.4	45.1	70.3	64.4
4	95.8	73.4	47.7	70.3	70.3	40.0	99.1	46.4	57.3	42.5	64.4	73.4
5	87.6	65.9	49.0	57.3	58.7	43.8	87.6	47.7	64.4	41.2	61.5	70.3
6	82.9	60.1	49.0	51.7	70.3	74.9	78.0	51.7	70.3	46.4	63.0	76.5
7	76.5	49.0	51.7	50.4	78.0	63.0	70.3	65.9	61.5	70.3	61.5	79.6
8	90.9	49.0	50.4	55.8	74.9	67.4	61.5	65.9	53.1	86.0	61.5	58.7
9	86.0	51.7	49.0	76.5	58.7	84.5	57.3	61.5	51.7	90.9	65.9	50.4
10	74.9	50.4	60.1	82.9	58.7	84.5	54.5	55.8	47.7	82.9	90.9	49.0
11	64.4	51.7	74.9	78.0	81.2	73.4	54.5	50.4	47.7	68.9	92.5	47.7
12	57.3	68.9	76.5	79.6	89.3	70.3	61.5	74.9	49.0	65.9	86.0	47.7
13	57.3	64.4	78.0	94.2	89.3	89.3	76.5	76.5	45.1	67.4	89.3	47.7
14	60.1	65.9	82.9	95.8	68.9	79.6	70.3	76.5	45.1	86.0	87.6	47.7
15	64.4	60.1	86.0	89.3	68.9	73.4	64.4	60.1	47.7	90.9	86.0	47.7
16	55.8	60.1	82.9	82.9	64.4	67.4	63.0	61.5	46.4	73.4	90.9	46.4
17	51.7	64.4	76.5	90.9	74.9	58.7	58.7	53.1	45.1	61.5	90.9	46.4
18	50.4	68.9	76.5	87.6	68.9	57.3	57.3	50.4	45.1	53.1	87.6	46.4
19	47.7	57.3	78.0	81.2	57.3	60.1	64.4	50.4	43.8	58.7	92.5	47.7
20	47.7	51.7	82.9	65.9	51.7	63.0	58.7	54.5	43.8	53.1	99.1	47.7
21	49.0	50.4	84.5	65.9	49.0	60.1	54.5	61.5	49.0	47.7	92.5	47.7
22	47.7	49.0	82.9	63.0	47.7	57.3	54.5	54.5	46.4	50.4	86.0	49.0
23	49.0	47.7	82.9	71.9	51.7	61.5	57.3	55.8	42.5	55.8	92.5	46.4
24	51.7	47.7	90.9	74.9	67.4	60.1	67.4	68.9	42.5	53.1	97.5	45.1
25	50.4	47.7	94.2	89.3	55.8	86.0	74.9	68.9	41.2	55.8	99.1	45.1
26	49.0	47.7	84.5	71.9	53.1	84.5	79.6	64.4	41.2	54.5	101	45.1
27	50.4	50.4	79.6	71.9	57.3	87.6	67.4	71.9	40.0	50.4	92.5	45.1
28	57.3	74.9	67.4	86.0	54.5	82.9	61.5	87.6	42.5	50.4	78.0	45.1
29	57.3	.....	64.4	92.5	57.3	73.4	67.4	87.6	58.7	50.4	70.3	43.8
30	61.5	.....	67.4	90.9	58.7	90.9	55.8	82.9	47.7	45.1	53.1	43.8
31	57.3	.....	84.5	.....	50.4	.....	51.7	84.5	.....	43.8	.....	43.8

[1] Described in U. S. Geol. Survey Water-Supply Paper 336 as about 8 miles northeast of Waimea.

Monthly discharge of Olokele ditch at weir, near Makaweli, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	95.8	47.7	64.0	3,940	B.
February	74.9	47.7	57.0	3,170	B.
March	94.2	47.7	71.5	4,400	B.
April	95.8	50.4	77.3	4,600	B.
May	92.5	47.7	66.2	4,070	B.
June	90.9	40.0	68.2	4,060	B.
July	101	51.7	68.6	4,220	B.
August	87.6	46.4	62.9	3,870	B.
September	79.6	40.0	50.9	3,030	B.
October	90.9	41.2	59.2	3,640	B.
November	101	42.5	79.6	4,740	B.
December	79.6	41.2	51.1	3,140	B.
The year	101	40.0	64.8	46,900	

POOWAIOMAHAIHAI DITCH NEAR WAIMEA, KAUAI.

Location.—About 110 feet below bridge station on Makaweli River, 250 feet below intake, and about 2 miles northeast of Waimea.

Records available.—October 27, 1911, to September 30, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made from timber bridge 15 feet above gage.

Diversion.—Ditch diverts part of flow of Makaweli River.

Accuracy.—Records good.

The following discharge measurement was made by W. V. Hardy:
April 30, 1913: Gage height, 1.67 feet; discharge, 13.5 second-feet.

Daily discharge, in second-feet, of Poowaiomahaihai ditch near Waimea, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.3	6.2	7.3	8.5	7.3	3.5	6.5	5.7	8.4
2	4.3	6.2	7.3	5.2	4.3	2.8	6.8	6.1	7.9
3	4.3	6.2	7.3	3.5	4.3	8.5	7.2	6.0	7.5
4	3.5	5.2	6.2	3.5	8.5	7.3	6.8	5.8	6.8
5	3.5	5.2	6.2	2.8	4.3	5.2	6.2	5.7	6.2
6	4.3	5.2	6.2	2.8	6.2	4.3	6.1	5.5	6.0
7	4.3	5.2	5.2	2.8	6.2	3.5	5.9	5.5	6.0
8	5.2	5.2	5.2	2.8	4.3	3.5	5.7	5.4	6.1
9	5.2	4.3	5.2	8.5	4.3	3.5	5.9	5.2	5.9
10	3.5	13	5.2	4.3	3.5	7.3	5.8	5.2	5.7
11	3.5	7.3	5.2	3.5	3.5	5.2	5.8	5.1	5.5
12	7.3	7.3	5.2	7.3	25	5.2	5.7	4.9	5.5
13	39	6.2	4.3	18	8.5	4.3	5.8	4.9	5.3
14	14	7.3	4.3	8.5	7.3	3.5	5.9	4.8	5.3
15	18	7.3	4.3	9.8	7.3	3.5	5.9	4.6	5.2
16	18	7.3	4.3	8.5	6.2	3.5	5.8	4.6	5.1
17	13	7.3	7.3	7.3	6.2	5.4	5.8	4.6	4.9
18	6.2	7.3	4.3	6.2	5.2	5.2	5.8	4.6	5.2
19	6.2	6.2	4.3	7.3	5.2	5.2	5.7	4.6	5.3
20	4.3	7.3	5.2	6.2	5.2	5.3	5.7	4.5	5.2
21	4.3	8.5	5.2	6.2	3.5	5.3	5.5	4.5	5.1
22	4.3	7.3	7.3	6.2	3.5	5.4	5.3	4.6	5.1
23	5.2	7.3	4.8	5.2	5.2	5.2	5.0	4.8	5.0
24	5.2	7.3	6.2	5.2	4.3	5.1	4.8	4.8	5.2
25	4.3	9.8	9.8	6.2	4.3	5.1	4.8	4.6	4.9
26	5.2	8.5	6.2	5.2	4.3	4.9	5.0	4.6	5.9
27	4.3	7.3	4.8	5.2	3.5	12	5.1	4.6	5.7
28	5.2	7.3	4.3	4.3	3.5	10	5.0	4.5	6.2
29	4.3	.....	3.5	8.5	3.5	6.5	5.2	4.5	6.1
30	4.3	.....	3.5	7.3	3.5	10	5.3	7.0	5.6
31	4.3	.....	3.5	.....	3.5	.....	5.2	7.2	.....

Monthly discharge of Poowaimahaihai ditch near Waimea, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	39	3.5	7.20	443	A.
February	13	4.3	6.99	388	A.
March	9.8	3.5	5.45	335	A.
April	18	2.8	6.23	371	A.
May	25	3.5	5.66	348	A.
June	12	2.8	5.53	329	A.
July	7.2	4.8	5.71	351	A.
August	7.2	4.5	5.13	315	A.
September	8.4	4.9	5.79	345	A.
The period				3,220	

HANAPEPE RIVER AT KOULA, NEAR ELEELE, KAUAI.

Location.—About 5 miles north of Eleele.
Records available.—August 18, 1910, to December 31, 1913.
Drainage area.—12.6 square miles.
Gage.—Friez water-stage recorder.
Control.—Fairly permanent.
Discharge measurements.—Made from cable or by wading.
Diversions.—Nearly all low-water flow diverted above station.
Accuracy.—Records fair.

The following discharge measurement was made by D. E. Horner:
October 14, 1913: Gage height, 1.56 feet; discharge, 46.3 second-feet

Daily discharge, in second-feet, of Hanapepe River at Koula, near Eleele, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	24	16	13	78	55	14	87	67	51	15	14	126
2	20	16	13	40	174	25	277	30	72	13	29	98
3	19	16	13	39	95	357	105	14	40	12	18	86
4	18	15	13	29	58	108	118	13	16	12	13	66
5	18	17	13	18	27	84	138	12	15	12	14	29
6	19	50	13	14	40	38	50	13	43	53	20	53
7	20	55	21	14	54	36	36	18	20	66	14	60
8	165	36	16	16	80	20	23	17	14	420	13	25
9	50	17	13	55	32	46	22	14	14	196	94	23
10	180	32	13	20	25	38	20	13	13	56	171	20
11	142	33	13	20	142	64	18	12	13	76	442	15
12	142	16	13	15	246	24	17	26	13	53	603	14
13	459	14	13	243	266	48	60	25	13	121	453	14
14	129	14	13	149	117	40	23	23	13	63	126	14
15	264	14	13	142	67	34	22	15	14	43	88	13
16	120	18	14	41	36	44	22	13	13	34	92	12
17	59	15	23	112	38	19	18	13	12	22	61	12
18	63	25	16	72	56	23	18	12	12	29	52	13
19	75	30	20	87	22	25	20	12	13	15	298	12
20	24	29	22	30	18	18	36	12	12	14	343	12
21	29	19	22	24	17	26	18	32	12	18	125	12
22	72	16	36	20	17	18	16	13	12	43	130	12
23	43	16	35	38	16	20	15	12	12	30	167	11
24	80	48	28	18	26	16	17	13	12	60	184	11
25	34	18	76	221	16	20	41	24	12	88	352	11
26	20	14	67	57	13	57	68	18	12	72	246	11
27	19	13	30	33	14	120	25	15	12	52	132	11
28	17	13	24	29	14	92	15	43	26	34	86	11
29	16	.....	29	82	14	36	29	143	12	15	363	11
30	16	.....	18	142	101	78	14	38	12	15	225	11
31	20	.....	22	.....	24	.....	14	123	.....	15	.....	11

Monthly discharge of Hanapepe River at Koula, near Eleèle, Kauai.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	459	16	76.6	4,710	B.
February	55	13	22.7	1,260	B.
March	76	13	22.2	1,360	B.
April	243	14	63.3	3,770	B.
May	266	13	61.9	3,810	B.
June	357	14	52.9	3,150	B.
July	277	14	45.2	2,780	B.
August	143	12	27.4	1,680	B.
September	72	12	18.7	1,110	B.
October	420	12	57.0	3,500	B.
November	603	13	166	9,880	B.
December	126	11	27.1	1,670	B.
The year	603	11	53.4	38,700	

HILOA DITCH AT HANAPEPE FALLS NEAR ELEELE, KAUAI.

Location.—About 8 miles north of Eleele and 335 feet below intake, which is just above confluence of the main and east branches of Hanapepe River.

Records available.—November 22, 1911, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made from plank across ditch at gage.

Diversion.—Ditch diverts all low-water flow from the main branch of Hanapepe River above Hanapepe Falls.

Accuracy.—Records good.

Discharge measurements of Hiloa ditch at Hanapepe Falls, near Eleele, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 21	W. V. Hardy	2.09	41.1
Oct. 14	D. E. Horner	2.18	45.5

Daily discharge, in second-feet, of Hiloa ditch at Hanapepe Falls, near Eleele, Kauai, for 1912–13.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.												
1	34	31	37	29	29	36	37	32	40	44	40	54
2	35	31	31	29	30	34	32	31	41	30	35	62
3	35	30	32	28	43	33	30	30	40	39	34	42
4	34	30	33	37	53	39	38	32	37	30	32	42
5	50	29	30	31	44	37	46	35	38	31	54	42
6	38	29	36	30	34	35	31	34	35	32	43	41
7	41	29	32	37	34	32	31	45	40	34	35	40
8	44	29	31	44	45	33	31	45	40	41	46	42
9	44	29	50	43	35	32	31	52	40	33	46	43
10	40	32	54	40	31	31	43	36	36	35	40	40
11	35	30	58	39	31	32	53	34	34	30	35	37
12	35	29	42	36	32	31	42	32	35	31	33	36
13	39	28	45	33	32	54	48	32	34	32	31	36
14	29	28	43	32	44	44	46	55	32	33	30	33
15	35	28	40	32	45	46	43	38	37	31	30	34
16	33	28	40	32	38	39	44	37	42	30	29	34
17	32	29	40	40	32	32	52	33	36	47	39	32
18	32	28	40	39	31	41	41	32	31	35	49	31
19	31	28	35	32	30	44	40	31	35	52	33	33
20	43	28	35	47	30	37	40	31	33	50	31	44
21	37	29	34	46	34	50	40	31	32	48	34	61
22	31	40	35	44	44	43	39	40	32	44	46	62
23	56	50	31	44	46	46	39	31	31	42	54	63
24	18	39	36	32	49	49	51	39	30	35	42	50
25	26	36	42	55	39	40	39	38	29	34	31	46
26	26	34	33	38	44	34	38	38	29	52	29	42
27	26	32	31	35	48	36	36	38	28	49	29	39
28	28	31	30	33	39	32	34	41	30	46	28	40
29	31	30	30	31	34	31	33	40	36	43	32	39
30	30	.....	29	30	42	30	36	42	42	45	45	38
31	33	.....	33	.....	40	.....	32	40	.....	44	.....	41
1913.												
1	39	32	29	47	48	36	43	30	40	29	32	19
2	37	32	28	46	43	32	44	38	40	28	34	19
3	34	31	28	48	44	48	44	35	42	27	37	18
4	33	32	28	42	44	14	45	32	39	27	31	18
5	33	34	28	37	43	14	46	31	42	38	31	38
6	33	39	28	34	41	44	44	34	43	48	42	38
7	33	46	46	31	48	42	41	37	38	41	35	0
8	56	45	29	33	50	44	39	36	34	45	30	35
9	39	44	28	52	46	46	41	38	35	44	38	35
10	48	43	28	37	40	44	38	34	31	42	45	35
11	52	41	28	36	44	45	34	30	30	42	45	35
12	46	35	27	33	47	40	34	45	35	43	39	34
13	40	32	27	38	52	46	35	40	30	44	39	34
14	41	31	28	44	18	46	36	38	31	39	37	33
15	49	31	27	45	39	46	37	35	32	42	40	32
16	37	30	40	39	39	45	43	31	29	45	38	31
17	37	30	52	45	41	38	34	30	29	38	37	32
18	22	39	31	42	40	40	32	30	29	37	37	33
19	0	47	34	42	40	41	33	28	29	35	39	32
20	42	37	41	45	37	34	34	29	28	33	39	31
21	42	37	40	48	35	46	34	44	28	32	37	31
22	50	33	51	37	34	42	32	34	29	31	40	31
23	43	38	44	48	32	38	31	30	28	38	40	30
24	44	43	38	37	48	33	35	37	27	38	41	30
25	45	33	53	35	40	46	42	44	27	0	44	28
26	40	31	52	40	32	46	46	39	27	0	35	30
27	36	30	40	44	37	53	40	32	27	33	33	29
28	35	29	40	48	37	42	34	36	28	40	31	29
29	34	.....	52	48	34	41	44	48	28	33	31	29
30	33	.....	48	45	44	40	33	42	28	31	25	29
31	34	.....	43	.....	39	.....	32	41	.....	31	.....	30

NOTE.—Gage not read on Sundays; discharge estimated.

Monthly discharge of Hiloa ditch at Hanapepe Falls, near Eleele, Kauai, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
January	56	18	34.9	2,150	A.
February	50	28	31.1	1,790	A.
March	58	29	37.0	2,280	A.
April	55	28	36.6	2,180	A.
May	53	29	38.1	2,340	A.
June	54	30	37.8	2,250	A.
July	53	30	39.2	2,410	A.
August	55	30	36.9	2,270	A.
September	42	28	35.2	2,090	A.
October	52	30	38.8	2,390	A.
November	54	28	37.2	2,210	A.
December	63	31	42.5	2,610	A.
The year	63	18	37.2	27,000	
1913.					
January	56	0	38.3	2,360	A.
February	47	29	35.9	1,990	A.
March	53	27	36.6	2,250	A.
April	52	31	41.5	2,470	A.
May	52	18	40.5	2,490	A.
June	53	14	40.4	2,400	A.
July	46	31	38.1	2,340	A.
August	48	28	35.7	2,200	A.
September	43	27	32.1	1,910	A.
October	48	0	34.6	2,130	A.
November	45	25	36.7	2,180	B.
December	38	0	29.3	1,800	B.
The year	56	14	36.5	26,500	

NOTE.—Jan. 18, 1913: Gates closed at noon and not opened until the 20th; practically no flow for this period.
May 14, June 4 and 5, 1913, Discharge affected by regulation. Oct. 25–26, no water in ditch; turned in at 4.15 p. m. Oct. 27. Dec. 7, 1913, no water in ditch.

HANAPEPE DITCH AT KOULA, NEAR ELEELE, KAUAI.

Location.—About 4 miles north of Eleele and about 4 miles below Hanapepe Falls.
Records available.—January 1, 1910, to December 31, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from cross timber of flume.
Diversions.—Ditch diverts all low-water flow of East Branch of Hanapepe River.
Accuracy.—Records good.
Cooperation.—Gage-height records furnished by Hawaiian Sugar Co.

The following discharge measurement was made by W. V. Hardy.
June 22, 1913: Gage height, 2.84 feet; discharge, 46.2 second-feet.

Daily discharge, in second-feet, of Hanapepe ditch at Koula, near Eleele, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	50	57	38	52	52	46	51	38	51	37	38	93
2	48	44	37	52	52	43	51	51	51	34	46	82
3	46	44	37	52	52	45	51	44	51	33	47	71
4	44	43	36	52	51	47	51	41	50	30	40	60
5	44	48	36	48	52	48	51	40	51	29	40	49
6	44	50	36	43	52	50	51	39	51	49	51	50
7	44	52	46	41	52	52	51	50	51	49	39	43
8	52	46	38	41	52	51	51	50	45	52	37	36
9	52	45	37	44	52	51	51	46	44	51	49	36
10	52	52	36	50	52	51	46	28	40	50	51	37
11	52	48	34	52	48	51	46	28	39	50	51	44
12	52	45	34	42	50	51	45	38	43	51	51	44
13	52	43	34	52	51	51	51	51	36	51	48	44
14	52	43	34	52	52	51	50	51	38	50	52	44
15	52	43	33	52	52	51	49	47	41	50	52	43
16	52	41	33	49	52	51	46	40	36	50	52	42
17	52	45	51	52	52	50	48	38	35	48	52	42
18	17	52	39	52	52	47	48	37	37	46	52	43
19	34	44	46	52	50	51	44	36	38	43	52	42
20	52	44	49	52	50	45	46	27	44	42	51	41
21	52	45	52	52	48	51	46	51	33	39	49	41
22	52	46	52	52	45	45	44	43	35	40	52	41
23	52	52	49	52	44	46	39	38	33	51	52	40
24	52	44	52	52	49	47	45	38	33	51	52	40
25	52	39	52	52	46	48	51	50	32	50	39	40
26	52	42	52	52	46	51	51	49	31	48	32	39
27	50	40	51	52	44	48	51	39	32	47	34	39
28	48	39	52	52	47	46	45	44	48	46	34	38
29	45	.....	52	52	52	51	50	51	44	42	69	38
30	42	.....	52	52	52	51	43	51	33	39	104	38
31	36	.....	41	.....	49	.....	40	51	.....	40	.....	39

NOTE.—Discharge interpolated for Sundays and holidays when no readings were made.

Monthly discharge of Hanapepe ditch at Koula, near Eleele, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	52	17	47.6	2,930	A.
February	57	39	45.6	2,530	A.
March	52	33	42.6	2,620	A.
April	52	41	50.1	2,980	A.
May	52	44	50.0	3,070	A.
June	52	43	48.9	2,910	A.
July	51	39	47.8	2,940	A.
August	51	27	42.7	2,630	A.
September	51	31	40.9	2,430	A.
October	52	29	44.8	2,750	A.
November	104	32	48.9	2,910	A.
December	93	36	45.8	2,820	A.
The year	104	17	46.3	33,500	

HANAPEPE DITCH AT WEIR NEAR HANAPEPE, KAUAI.

Location.—About 2½ miles northeast of Hanappe at measuring weir maintained by Hawaiian Sugar Co., on the Hanapepe ditch below the last siphon across Hanapepe River.

Records available.—January, 1910, to December 31, 1913; records show amount of water delivered by the ditch at the cane fields.

Gage.—Vertical staff on right bank; zero on gage equals crest of weir.

Control.—Probably permanent.

Discharge measurements.—Computed from formula for a 12-foot, sharp-crested weir with end contractions; checked by current-meter measurements.

Cooperation.—Gage-height records furnished by Hawaiian Sugar Co.

Daily discharge, in second-feet, of Hanapepe ditch at weir near Hanapepe, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	46.4	43.8	36.3	41.2	41.2	45.1	45.1	37.5	43.8	34.0	40.0	.....
2	46.4	41.2	35.2	41.2	41.2	42.5	45.1	38.8	43.8	35.2	40.0	.....
3	45.1	41.2	35.2	42.5	41.2	40.0	46.4	42.5	43.8	32.8	40.0	.....
4	43.8	40.0	34.0	41.2	40.0	.....	45.1	42.5	43.8	30.4	41.2	.....
5	42.5	41.2	32.8	41.2	30.4	.....	45.1	38.8	42.5	30.4	40.0	.....
6	42.5	42.5	32.8	37.5	37.5	.....	45.1	38.8	42.5	35.2	41.2	40.0
7	42.5	45.1	35.2	36.3	41.2	45.1	45.1	40.0	43.8	40.0	42.5	.....
8	45.1	46.4	38.8	35.2	41.2	46.4	42.5	41.2	42.5	43.8	40.0	21.8
9	46.4	45.1	36.3	35.2	41.2	45.1	42.5	40.0	40.0	45.1	42.5	36.3
10	45.1	43.8	34.0	37.5	41.2	46.4	41.2	38.8	40.0	45.1	46.4	37.5
11	42.5	46.4	32.8	37.5	37.5	46.4	40.0	37.5	37.5	46.4	46.4	38.8
12	43.8	46.4	31.6	38.8	40.0	46.4	40.0	37.5	36.3	46.4	46.4	41.2
13	45.1	42.5	31.6	38.8	27.1	45.1	40.0	38.8	35.2	46.4	49.0	42.5
14	45.1	41.2	31.6	41.2	.....	45.1	41.2	41.2	35.2	45.1	49.0	42.5
15	46.4	41.2	31.6	42.5	.....	45.1	41.2	41.2	35.2	38.8	45.1	42.5
16	47.7	41.2	32.8	42.5	30.4	45.1	41.2	38.8	35.2	42.5	40.0	42.5
17	47.7	40.0	34.0	42.5	46.4	45.1	41.2	36.3	34.0	43.8	46.4	41.2
18	28.2	41.2	40.0	42.5	46.4	45.1	38.8	34.0	32.8	40.0	47.7	40.0
19	.....	43.8	41.2	42.5	46.4	43.8	37.5	32.8	35.2	19.8	49.0	41.2
20	32.8	45.1	42.5	42.5	45.1	42.5	40.0	32.8	34.0	35.2	47.7	40.0
21	47.7	45.1	43.8	42.5	43.8	43.8	40.0	36.3	32.8	38.8	46.4	41.2
22	47.7	42.5	43.8	41.2	42.5	42.5	38.8	37.5	32.8	38.8	.....	41.2
23	47.7	42.5	43.8	41.2	42.5	42.5	37.5	36.3	31.6	41.2	.....	40.0
24	42.5	42.5	42.5	41.2	42.5	41.2	37.5	34.0	30.4	42.5	.....	40.0
25	23.9	43.8	42.5	40.0	43.8	41.2	38.8	35.2	30.4	23.9	40.0	40.0
26	47.7	41.2	43.8	41.2	42.5	43.8	41.2	38.8	30.4	.....	37.5	40.0
27	47.7	40.0	41.2	41.2	42.5	43.8	41.2	38.8	30.4	.....	36.3	38.8
28	46.4	37.5	43.8	41.2	41.2	41.2	41.2	38.8	31.6	.....	36.3	38.8
29	45.1	.....	42.5	42.5	41.2	34.0	40.0	40.0	35.2	30.4	35.2	37.5
30	43.8	.....	40.0	42.5	41.2	45.1	41.2	42.5	32.8	40.0	.....	36.3
31	43.8	.....	40.0	.....	43.8	.....	38.8	43.8	.....	40.0	.....	35.2

NOTE.—Ditch dry Jan. 19; May 14–15; June 4–6; Oct. 26–28; Nov. 22–24 and 30; Dec. 1–5 and 7.

Monthly discharge of Hanapepe ditch at weir near Hanapepe, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January 1–18, 20–31	47.7	23.9	43.6	2,590
February	46.4	37.5	42.7	2,370
March	43.8	31.6	37.7	2,320
April	42.5	35.2	40.5	2,410
May 1–13, 16–31	46.4	27.1	40.8	2,350
June 1–3, 7–30	46.4	34.0	43.7	2,340
July	46.4	37.5	41.3	2,540
August	43.8	32.8	38.4	2,360
September	43.8	30.4	36.5	2,170
October 1–25, 29–31	46.4	19.8	38.3	2,130
November 1–21, 25–29	49.0	35.2	42.8	2,200
December 6, 8–31	42.5	21.8	39.1	1,930
The period	49.0	19.8	40.4	27,700

NOTE.—Mean for month and period is for days when ditch carried water.

HULEIA RIVER NEAR LIHUE, KAUAI.

Location.—About 300 feet above stone bridge where wagon road from Lihue to the Rice plantation crosses stream; about 4 miles southeast of Lihue.
Records available.—May 8, 1912, to December 31, 1913.
Drainage area.—17.9 square miles.
Gage.—Vertical low-water staff gage; inclined high-water gage.
Control.—Probably permanent.
Discharge measurements.—Made by wading.
Cooperation.—Station is maintained in cooperation with Mr. Charles Rice.
Diversions.—Several above station.
Accuracy.—Records poor.

Daily discharge, in second-feet, of Huleia River near Lihue, Kauai, for 1912–13.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.								
1	.....	7.2	6.4	7.0	7.2	5.8	7.4	9.0
2	.....	7.2	6.2	6.4	6.4	5.5	7.4	87
3	.....	7.2	5.8	6.4	7.2	5.5	7.2	116
4	.....	9.0	5.7	6.2	7.2	5.5	7.2	55
5	.....	11	5.5	6.2	7.2	5.7	7.2	40
6	.....	9.4	5.5	7.0	61	5.5	7.2	31
7	7.4	8.3	5.5	6.4	8.6	5.5	7.2	31
8	7.2	7.4	5.5	5.8	7.2	6.0	7.2	31
9	7.2	7.2	5.5	5.5	7.2	7.0	40	24
10	7.2	7.2	7.6	5.7	7.2	7.2	8.1	20
11	7.2	7.4	9.0	5.5	6.4	7.4	8.1	18
12	7.2	7.4	7.4	5.5	5.8	7.4	7.7	18
13	7.2	7.2	7.0	5.5	5.7	5.8	6.4	17
14	7.2	7.4	40	7.2	5.5	5.8	5.8	16
15	9.0	7.4	26	9.2	5.5	5.5	5.8	15
16	8.1	11	7.4	6.5	5.5	5.5	5.7	14
17	7.4	7.2	9.0	6.4	5.5	5.5	5.7	14
18	7.2	7.2	7.4	5.8	5.5	5.5	7.0	14
19	7.2	7.2	7.2	5.8	6.4	6.4	6.2	12
20	7.0	7.2	7.2	5.8	5.7	7.2	5.7	14
21	6.9	7.2	7.2	5.8	5.5	31	6.4	14
22	6.5	7.0	7.2	6.2	5.5	9.0	7.2	12
23	7.2	6.7	7.0	5.8	5.5	7.2	8.1	55
24	7.4	6.4	7.0	7.2	5.5	7.2	7.4	87
25	7.2	6.4	7.2	7.0	5.5	7.0	7.2	73
26	7.2	6.4	7.2	7.0	5.5	24	6.5	64
27	7.2	6.4	7.2	52	5.5	8.1	5.7	27
28	8.1	6.4	7.0	7.2	5.5	7.2	5.7	16
29	8.5	6.4	7.2	7.0	5.5	9.0	20	14
30	7.6	6.4	7.2	7.2	5.5	9.4	8.1	14
31	7.4	.....	7.2	7.4	.....	8.5	.....	14

Daily discharge, in second-feet, of Huleia River near Lihue, for 1912–13—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	12	7.2	11	26	11	9.7	14	7.7	14	6.0	12	70
2	11	6.4	11	21	9.7	12	46	12	11	6.0	67	67
3	9.0	5.7	11	18	9.7	191	25	9.7	9.7	6.0	25	73
4	8.1	5.5	10	16	9.7	109	15	7.7	8.1	7.7	20	64
5	7.4	7.2	10	15	9.7	80	12	7.7	7.7	9.9	18	55
6	7.4	174	9.2	15	9.9	61	11	7.7	7.7	11	18	52
7	7.2	58	8.3	15	9.9	67	10	7.7	7.7	12	21	80
8	7.2	40	7.2	18	9.7	124	9.7	7.7	7.7	173	18	70
9	7.4	37	7.2	30	9.7	67	8.7	7.7	7.7	191	18	61
10	8.1	31	6.4	25	9.7	55	8.7	7.7	7.7	44	31	52
11	9.2	17	5.7	23	9.7	28	8.7	7.7	7.7	18	44	28
12	10	12	5.5	23	44	21	7.9	7.7	7.7	14	55	23
13	14	11	7.2	28	101	18	7.7	7.7	7.7	12	35	18
14	14	9.6	8.1	21	55	15	7.7	7.4	7.7	12	25	16
15	18	8.1	7.4	20	94	12	7.7	6.8	7.5	11	67	15
16	18	8.1	6.4	18	28	11	7.7	6.2	7.5	11	18	14
17	22	7.6	5.8	16	25	11	7.7	6.2	7.5	11	39	12
18	24	7.2	5.7	15	23	11	7.7	6.0	7.5	23	39	12
19	24	8.1	5.5	15	22	9.9	7.7	6.0	6.8	11	25	12
20	45	9.0	5.5	14	20	9.7	7.7	6.0	6.8	11	116	12
21	61	11	5.5	12	19	9.7	7.7	6.0	8.1	9.9	132	12
22	55	12	5.5	11	16	9.3	7.7	6.0	7.7	9.9	73	12
23	55	13	272	10	15	8.7	7.7	6.0	6.8	12	94	12
24	52	40	73	9.7	12	8.7	7.7	6.0	6.2	21	64	12
25	17	17	44	9.7	9.7	8.7	7.7	6.0	6.0	74	108	12
26	16	15	25	9.7	10	8.1	7.7	6.0	6.0	70	94	12
27	12	12	23	9.7	9.7	9.7	7.7	6.0	6.0	35	73	12
28	11	12	21	9.7	9.7	11	7.7	6.0	6.0	25	61	12
29	9.0	.....	22	9.7	9.7	11	7.7	14	6.0	16	49	12
30	7.4	.....	23	28	9.7	12	7.7	12	6.0	15	49	12
31	8.1	.....	25	.....	9.7	.....	7.7	9.7	.....	12	.....	12

Monthly discharge of Huleia River near Lihue, Kauai, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
May 7–31	9.0	6.5	7.40	367	B.
June	11	6.4	7.45	443	B.
July	40	5.5	8.56	526	B.
August	52	5.5	7.92	487	B.
September	61	5.5	7.96	474	B.
October	31	5.5	8.03	494	B.
November	40	5.7	8.42	501	B.
December	116	9.0	31.8	1,960	B.
The period	.....	.....	.....	5,250	
1913.					
January	61	7.2	18.9	1,160	C.
February	174	5.5	21.5	1,190	C.
March	272	5.5	22.4	1,380	C.
April	30	9.7	17.0	1,010	C.
May	101	9.7	21.0	1,290	C.
June	191	8.1	34.0	2,020	C.
July	46	7.7	10.4	640	C.
August	14	6.0	7.6	467	C.
September	14	6.0	7.6	452	C.
October	191	6.0	29.0	1,780	C.
November	132	12	50.3	2,990	C.
December	80	12	30.3	1,860	C.
The year	272	5.5	22.4	16,200	

HANAMAULU RIVER AT KAPAIA, NEAR LIHUE, KAUAI.

Location.—At wagon-road bridge about 600 feet north of village of Kapaia and about 1.5 miles north of Lihue.

Records available.—September 4, 1911, to December 31, 1913.

Drainage area.—6.41 square miles.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made from lower side of bridge during high water and by wading at low-water stages.

Diversions.—Several above station.

Accuracy.—Records for May and June, good; for all other months, only fair.

Discharge measurements of Hanamaulu River at Kapaia, near Lihue, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec. ft.*
Jan. 29	D. E. Horner	5.30	12.3	May 31	W. V. Hardy	5.69	24.2
May 31	W. V. Hardy	5.54	17.6	May 31	....do	5.62	21.6

Daily discharge, in second-feet, of Hanamaulu River at Kapaia, Lihue, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	25	9.7	20	21	6.5	19	5	13	1.8	3.0	47	25
2	30	9.2	14	19	7.5	18	5	13	1.5	3.0	41	20
3	23	8.7	8.5	20	8.1	82	8.5	9.8	4.0	3.0	35	54
4	23	11	3.0	16	7.3	35	11	6.5	3.0	3.0	35	25
5	19	9.7	1.5	9.8	6.5	30	14	5.8	2.5	2.0	30	22
6	15	96	4.2	8.5	5.0	41	10	5.8	4.0	1.0	34	28
7	11	47	3.4	8.5	1.0	35	5	5.6	3.0	.5	22	24
8	11	29	4.6	9.8	5.0	33	4	5.3	2.0	1.0	21	20
9	8.7	24	4.7	11	5.0	31	5	5.0	1.8	21	12	13
10	8.7	18	4.8	8.5	6.5	36	5	3.2	1.8	7.5	3	11
11	7.7	9.8	3.8	9.8	18	25	4	1.5	2.0	2.0	3.5	11
12	12	8.1	3.8	7.5	29	13	5	3.0	2.0	2.5	9.8	11
13	17	7.5	4.6	6.2	41	14	10	3.0	1.8	3.0	16	16
14	12	14	5.0	5.0	30	20	16	1.5	1.9	1.5	11	14
15	11	16	4.6	2.5	41	18	7.5	1.0	2.0	13	3	12
16	9.7	14	5.6	5.0	30	17	13	1.5	2.5	8.5	4	11
17	9.7	13	6.5	16	41	16	17	2.8	3.0	6.5	5	13
18	11	13	5.8	6.5	36	14	9.8	4.0	2.0	25	20	8.5
19	10	20	4.2	5.0	30	25	6.5	1.0	1.5	19	30	9.8
20	9.7	13	4.4	3.8	24	5	7	3.0	1.0	13	61	9.8
21	9.7	16	5.0	2.5	25	1	7.5	1.0	4.2	14	168	7.4
22	15	16	4.6	2.5	30	.5	6.5	1.2	7.5	11	47	5.0
23	12	26	12	5.0	24	(a)	5	1.5	5.8	25	41	8.5
24	12	35	19	7.5	30	(a)	4	1.5	6.5	54	35	9.8
25	11	16	20	8.5	28	(a)	5	1.5	2.0	25	35	9.2
26	12	19	22	6.5	25	(a)	7.5	1.5	2.5	25	34	8.5
27	12	25	20	10	22	5	7.5	1.6	2.5	25	28	7.5
28	9.7	22	12	14	15	12	7.5	3.5	7.8	30	30	7.0
29	12	.....	12	7.5	7.5	8	7.1	16	13	25	24	6.5
30	12	.....	13	7.5	11	5	9.2	19	4.0	44	24	11
31	9.9	.....	19	.....	20	.....	8.5	10	.....	41	.....	11

(a) No discharge June 23–26.

NOTE.—Discharge estimated for Sundays and holidays, on which no observations were made.

Monthly discharge of Hanamaulu River at Kapaia, near Lihue, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	30	7.7	13.3	818	B.
February	96	7.5	20.2	1,120	B.
March	22	1.5	8.89	547	B.
April	21	2.5	9.03	537	B.
May	41	1.0	19.9	1,220	A.
June	82	(a)	18.6	1,110	A.
July	17	4.0	7.86	483	B.
August	19	1.0	4.95	304	B.
September	13	1.0	3.36	200	B.
October	54	.5	14.8	910	B.
November	168	3.0	30.3	1,800	C.
December	54	5.0	14.5	892	C.
The year	168	(a)	13.7	9,940	

a Channel dry.

SOUTH FORK OF WAILUA RIVER ABOVE WAIEHU FALLS, NEAR LIHUE, KAUAI.

Location.—One mile above Waiehu Falls and about 7 miles northeast of Lihue.
Records available.—December 10, 1911, to December 31, 1913.
Drainage area.—22.4 square miles.
Gage.—Friez water-stage recorder.
Control.—Probably permanent.
Discharge measurements.—Made from cable or by wading.
Diversions.—Several above station.
Accuracy.—Records good except for November and December, when they were only fair.

Discharge measurements of South Fork of Wailua River above Waiehu Falls, near Lihue, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 23	D. E. Horner	3.61	79.0	May 30	W. V. Hardy	4.12	192
23	do	3.56	76.6				

Daily discharge, in second-feet, of South Fork of Wailua River above Waiehu Falls, near Lihue, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	87	58	54	127	116	58	192	129	204	15	109	.....
2	66	50	53	118	204	68	453	80	270	19	116	.....
3	56	42	51	113	162	1,150	162	45	225	23	105	.....
4	54	40	45	111	131	295	173	40	98	25	105	.....
5	54	40	42	83	96	204	192	37	91	23	106	.....
6	66	608	40	72	173	189	98	37	201	109	107	.....
7	56	363	124	60	173	135	76	48	138	94	108	.....
8	239	184	98	58	384	109	72	45	80	838	109	.....
9	116	109	74	157	150	127	76	43	66	774	335	.....
10	228	109	64	72	116	116	60	42	58	232	418	128
11	184	120	60	72	295	154	56	40	53	195	792	135
12	292	87	56	48	677	105	60	53	46	164	1,060	130
13	760	74	96	343	663	154	154	87	40	242	925	130
14	242	68	96	256	225	138	83	80	42	167	375	119
15	593	94	53	253	462	120	76	66	56	207	267	116
16	458	116	45	118	288	160	72	46	46	152	253	112
17	181	66	89	239	246	98	66	40	40	157	219	110
18	142	98	64	219	256	107	56	36	37	181	204	112
19	120	133	68	150	152	184	68	38	40	131	962	101
20	98	94	87	98	127	111	107	40	34	107	.....	88
21	144	80	98	94	116	105	70	150	26	189	.....	92
22	449	72	102	78	107	56	54	64	38	253	.....	92
23	187	76	210	138	87	56	48	48	13	127	.....	92
24	359	162	142	80	100	48	54	45	19	219	.....	88
25	154	74	184	288	78	53	138	74	24	162	.....	85
26	105	62	135	120	72	94	242	60	24	131	.....	88
27	105	60	60	83	74	201	120	43	14	109	.....	79
28	64	74	66	83	74	195	76	98	14	213	.....	85
29	100	.....	120	118	76	109	131	278	14	124	.....	66
30	56	.....	98	225	201	113	78	120	17	131	.....	68
31	76	.....	87	.....	76	.....	74	274	.....	131	.....	66

NOTE.—Evidences point to a maximum discharge of about 4,500 second-feet on the night of Nov. 20. No record Nov. 20 to Dec. 9. Discharge interpolated Nov. 5–7.

Monthly discharge of South Fork of Wailua River above Waiehu Falls, near Lihue, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	760	54	190	11,700	A.
February	608	40	115	6,390	A.
March	210	40	85.8	5,280	A.
April	343	48	136	8,090	A.
May	677	72	199	12,200	A.
June	1,150	48	160	9,520	A.
July	453	48	111	6,820	A.
August	278	36	75	4,610	A.
September	270	13	68.9	4,100	A.
October	838	15	182	11,200	A.
November 1–19	1,060	105	351	13,200	B.
December 10–31	135	66	99.2	4,320	B.
The period	.....	.....	.....	97,400	

HANAMAULU DITCH NEAR LIHUE, KAUAI.

Location.—About 6 miles northwest of Lihue, in flume 180 feet above point where the Kauai Electric Co.'s power line crosses the South Fork of Wailua River.

Records available.—July 1, 1910, to December 31, 1913.

Gage.—Vertical staff installed September 30, 1911, on left side of flume, 13 feet from upper end; new datum.

Control.—Probably permanent.

Discharge measurements.—Made in flume.

Diversion.—Ditch diverts part of flow of the South Fork of Wailua River.

Accuracy.—Records very good.

The following discharge measurement was made by D. E. Horner:
January 31, 1913: Gage height, 2.14 feet; discharge, 38 second-feet.

Daily discharge, in second-feet, of Hanamaulu ditch near Lihue, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	38	35	28	32	32	41	40	38	37	41	24	.....
2	38	38	28	32	32	41	39	36	38	38	23	.....
3	38	44	27	32	41	33	39	36	38	34	24	.....
4	27	42	27	32	41	9.2	40	38	37	32	15	.....
5	27	42	41	30	40	9.2	40	38	37	32	15	.....
6	27	47	41	29	40	9.2	40	56	39	41	15	.....
7	32	41	42	29	41	9.2	40	38	40	47	15	.....
8	32	32	42	29	40	40	40	38	40	47	15	.....
9	35	32	41	32	40	39	39	38	38	33	15	.....
10	35	14	41	32	40	39	39	35	38	32	15	12
11	36	14	41	40	32	38	38	35	38	41	15	12
12	41	32	38	40	32	39	38	35	40	41	11	12
13	41	30	36	41	32	39	36	40	40	35	11	32
14	40	30	36	40	32	39	36	40	36	34	12	32
15	40	30	36	40	22	39	36	40	35	34	15	32
16	39	30	38	40	22	39	36	40	35	36	15	32
17	38	30	38	40	22	39	36	39	35	36	32	32
18	38	30	40	40	15	39	36	39	35	36	32	24
19	38	28	40	40	15	39	36	39	36	24	32	23
20	38	28	40	38	14	35	40	39	36	35	33	23
21	38	28	40	38	29	35	40	40	36	36	13	23
22	47	28	40	36	29	38	35	39	40	36	13	23
23	47	28	42	38	29	38	35	38	40	36	.....	23
24	40	32	24	38	29	38	44	38	40	32	.....	23
25	40	29	40	47	29	41	44	38	40	32	.....	23
26	38	28	40	34	29	40	45	38	39	32	.....	23
27	38	28	32	34	38	40	41	38	38	32	.....	23
28	38	28	32	32	38	40	41	38	38	33	.....	32
29	37	.....	32	32	39	40	36	40	39	32	5	32
30	36	.....	32	32	41	40	36	37	38	32	5	32
31	36	.....	32	.....	41	.....	36	37	.....	32	.....	32

NOTE.—Ditch dry, Nov. 23–28 and Dec. 1–9.

Monthly discharge of Hanamaulu ditch near Lihue, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	47	27	37.2	2,290	A.
February	47	14	31.4	1,740	A.
March	42	24	36.3	2,230	A.
April	47	29	35.6	2,120	A.
May	41	14	32.1	1,970	A.
June	41	9.2	34.8	2,070	A.
July	45	35	38.6	2,370	A.
August	56	35	38.6	2,370	A.
September	40	35	37.9	2,260	A.
October	47	24	35.3	2,170	A.
November	33	0	14.0	832	A.
December	32	0	17.9	1,100	A.
The year	56	0	32.5	23,500	

LIHUE DITCH NEAR LIHUE, KAUAI.

Location.—About 5 miles northwest of Lihue, at point where Kauai Electric Co.'s power line crosses the ditch.

Records available.—July 1, 1910, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversion.—Ditch diverts part of flow of the South Fork of Wailua River.

Accuracy.—Records fair.

The following discharge measurement was made by W. V. Hardy and D. E. Horner: May 29, 1913: Gage height, 1.42 feet; discharge, 8.93 second-feet.

Daily discharge, in second-feet, of Lihue ditch near Lihue, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.8	7.2	3.8	8.8	10.4	9.2	9.6	9.8	10.2	10.2	8.8	.....
2	8.8	7.2	3.8	8.8	10.4	9.6	9.6	10.0	10.8	10.0	8.8	.....
3	8.4	7.1	3.8	8.0	10.4	3.7	9.2	9.3	10.7	9.6	9.0	.....
4	8.4	6.8	3.8	8.0	10.4	.....	9.5	9.1	10.0	9.4	8.8	.....
5	8.4	6.5	3.8	8.0	10.4	7.4	9.4	9.0	11.2	9.4	8.0	.....
6	8.4	9.6	7.2	7.6	10.4	7.2	9.4	9.0	11.1	9.9	6.6	.....
7	8.4	.....	7.2	7.6	10.4	7.2	9.4	8.8	10.4	10.9	6.6	.....
8	9.6	.....	7.2	7.2	10.4	9.0	9.4	8.8	10.4	12.0	6.6	.....
9	9.6	.....	7.2	7.6	10.4	9.0	9.0	9.8	10.2	10.4	6.5	.....
10	9.8	.....	7.2	7.6	9.6	9.0	9.0	8.9	10.2	9.9	6.5	.....
11	10.0	.....	7.2	8.0	9.6	9.0	8.8	8.8	9.6	11.4	6.7	.....
12	10.4	4.4	7.2	8.0	10.4	9.8	9.2	8.8	9.6	11.4	7.4	.....
13	10.6	4.4	7.2	8.8	8.0	9.8	9.4	10.0	10.4	11.2	7.5	.....
14	8.8	4.0	7.2	8.8	9.6	9.8	9.4	9.6	10.1	10.6	7.4	.....
15	8.8	3.9	7.2	8.8	9.6	9.8	9.4	9.4	10.1	10.6	7.4	.....
16	8.8	3.8	7.6	8.8	3.7	9.8	9.4	10.0	9.6	10.4	7.4	.....
17	8.8	3.8	7.6	8.8	3.7	9.8	9.4	9.6	9.6	10.6	8.0	2.5
18	8.8	3.8	8.0	8.8	3.7	9.8	9.4	9.0	9.6	10.6	8.0	2.5
19	8.4	3.6	8.0	8.8	3.7	9.8	9.4	9.6	9.6	3.7	8.0	2.5
20	8.4	3.6	8.0	8.0	3.7	9.1	9.8	9.8	9.5	10.4	8.0	2.5
21	8.4	4.0	8.4	8.9	3.7	9.0	9.8	10.4	10.1	10.4	8.0	6.9
22	10.4	4.0	8.5	8.0	8.0	9.0	8.9	10.4	10.1	10.9	6.4	6.9
23	8.8	3.9	8.8	8.0	8.0	9.0	8.9	10.2	10.1	10.0	6.4	6.9
24	8.8	4.4	8.0	8.0	8.0	9.0	9.8	9.6	9.8	9.8	6.4	7.0
25	8.0	4.0	8.4	8.8	8.0	9.0	10.4	9.5	9.6	9.9	6.3	7.1
26	7.6	3.8	8.0	10.4	9.6	9.7	10.4	9.6	9.6	10.2	6.2	7.1
27	7.2	3.8	6.8	10.4	9.6	9.7	10.4	9.6	9.4	10.4	6.2	7.2
28	7.2	3.8	6.8	10.4	9.6	9.8	10.0	9.8	10.2	10.0	6.4	7.2
29	7.2	.....	6.8	10.4	8.8	9.8	9.9	10.4	10.0	10.0	6.4	7.2
30	7.2	.....	8.8	10.4	8.9	9.6	9.8	10.8	10.0	9.6	7.0	7.2
31	7.2	.....	8.8	.....	9.6	.....	9.8	10.6	.....	9.6	.....	7.2

NOTE.—Ditch dry Feb. 7–11, June 4, Dec. 1–16.

Monthly discharge of Lihue ditch near Lihue, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	10.6	7.2	8.66	532	B.
February	9.6	0	3.98	221	B.
March	8.8	3.8	7.04	433	B.
April	10.4	7.2	8.59	511	B.
May	10.4	3.7	8.41	517	B.
June	9.8	0	8.63	513	B.
July	10.4	8.8	9.52	585	B.
August	10.8	8.8	9.61	591	B.
September	11.2	9.4	10.1	601	B.
October	12.0	3.7	10.1	621	B.
November	9.0	6.2	7.26	432	B.
December	7.2	0	2.84	175	B.
The year	12.0	0	7.92	5,730	

NORTH FORK OF WAILUA RIVER NEAR LIHUE, KAUAI.

Location.—About 12 miles north of Lihue and 300 feet below confluence of main and east branches of the stream.

Records available.—August 1 to October 28, 1910; December 28, 1910, to December 31, 1913.

Drainage area.—14.6 square miles.

Gage.—Friez automatic water-stage recorder. Datum changed.

Control.—Fairly permanent.

Discharge measurements.—Made from wire suspension footbridge.

Diversions.—Kanaha ditch diverts part of flow above the station.

Accuracy.—Records fair from January to May; all other records good.

The following discharge measurement was made by W. V. Hardy:
May 29, 1913: Gage height, 0.52 foot; discharge, 39.7 feet.

Daily discharge, in second-feet, of North Fork of Wailua River near Lihue, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	57	27	58	81	39	40	95	42	95	33	54	202
2	54	24	85	62	104	58	267	36	182	30	116	168
3	43	23	84	64	54	551	111	34	150	27	77	220
4	36	23	81	51	40	146	119	32	77	26	57	213
5	38	22	75	35	30	106	104	32	60	25	52	224
6	37	217	66	26	88	109	78	32	111	62	57	200
7	48	132	111	23	85	85	68	35	83	57	84	146
8	130	67	44	23	106	70	56	38	60	368	62	124
9	57	50	22	51	52	92	47	42	54	178	184	111
10	108	49	17	35	41	84	43	36	44	97	213	103
11	111	50	16	43	140	92	42	32	41	120	394	92
12	162	39	15	27	232	63	47	50	42	106	590	90
13	353	35	19	130	177	88	90	47	38	144	394	85
14	128	33	18	156	111	70	63	64	36	111	173	78
15	366	46	22	147	90	64	58	41	38	84	127	76
16	192	43	25	71	84	70	54	63	36	88	106	73
17	102	34	29	153	98	49	44	42	32	74	98	71
18	78	66	32	106	109	54	36	37	32	77	100	71
19	73	52	36	81	73	65	51	49	30	57	262	69
20	64	65	39	59	66	60	77	34	29	49	353	59
21	122	52	43	54	58	55	43	58	34	146	659	62
22	196	43	53	51	49	38	37	42	40	132	424	54
23	85	58	58	61	46	38	36	34	26	78	343	47
24	142	72	229	40	64	34	38	34	28	155	289	44
25	84	42	222	132	49	42	83	45	26	83	504	42
26	70	35	172	49	42	66	108	39	26	65	420	42
27	65	31	92	38	45	97	71	35	26	66	257	41
28	54	30	72	34	47	114	40	88	58	112	218	40
29	47	.....	65	37	47	69	85	171	30	68	570	36
30	42	.....	53	82	87	98	43	88	29	69	303	32
31	39	.....	50	.....	45	.....	38	116	.....	63	.....	35

Discharge estimated Mar. 15–20.

Monthly discharge of North Fork of Wailua River near Lihue, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	366	36	103	6,330	B.
February	217	22	52.1	2,890	B.
March	229	15	64.6	3,970	B.
April	156	23	66.7	3,970	B.
May	232	30	77.3	4,750	B.
June	551	34	88.9	5,290	A.
July	267	36	70.1	4,310	A.
August	171	32	50.6	3,110	A.
September	182	26	53.1	3,160	A.
October	368	25	91.9	5,650	A.
November	659	52	251	14,900	A.
December	224	32	95.2	5,850	A.
The year	659	15	88.7	64,200	

KANAHA DITCH NEAR LIHUE, KAUAI.

Location.—About 9 miles north of Lihue and about 500 feet above the point where the Kauai Electric Co.'s power line crosses the ditch.

Records available.—August 6, 1910, to December 31, 1913.

Gage.—Vertical staff; datum changed.

Discharge measurements.—Made in flume 100 feet above gage.

Diversion.—Diverts part of flow of North Fork of Wailua River.

Accuracy.—Records good.

Discharge measurements of Kanaha ditch near Lihue, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*
May 28[a]	D. E. Horner	2.02	27.9
May 30[a]	W. V. Hardy	2.43	33.2

[a] Measurements refer to gage installed May 28.

Daily discharge, in second-feet, of Kanaha ditch near Lihue, Kauai, for 1912–13.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.												
1	24	21	25	25	28	28	28	27	35	31	30	32
2	24	20	25	24	27	27	28	30	35	30	31	35
3	.....	20	28	24	28	27	28	30	33	31	31	33
4	.....	20	27	25	33	27	28	30	33	31	31	11
5	.....	20	25	28	30	27	28	30	33	34	35	11
6	.....	19	25	27	28	28	28	39	35	32	35	11
7	.....	19	28	30	27	28	31	31	33	32	33	10
8	.....	19	27	30	30	28	33	33	33	33	33	11
9	.....	25	28	30	28	28	28	33	33	32	35	11
10	.....	24	28	28	27	28	33	33	33	32	34	22
11	.....	24	31	27	26	28	33	33	33	33	32	22
12	.....	24	31	27	25	28	33	33	30	33	30	22
13	.....	24	31	25	25	28	33	33	30	32	30	22
14	.....	22	30	25	28	28	35	35	30	31	30	21
15	.....	22	28	25	28	28	31	31	31	31	33	21
16	.....	22	27	27	28	28	28	33	32	30	29	21
17	.....	24	27	31	28	28	33	39	30	34	29	27
18	.....	24	26	22	28	27	39	31	28	33	32	27
19	.....	24	25	21	28	27	31	31	28	34	33	30
20	.....	24	25	21	28	27	31	31	31	34	34	31
21	.....	22	28	16	28	28	31	31	31	34	34	29
22	21	25	28	16	28	30	28	39	32	34	35	30
23	22	25	28	16	28	30	28	39	31	34	.....	29
24	22	25	22	25	29	28	28	39	30	33	.....	30
25	22	28	24	28	29	27	30	35	28	33	.....	28
26	21	28	24	24	29	27	31	33	28	35	11	27
27	21	28	24	27	29	30	31	33	28	34	11	27
28	21	25	22	27	31	28	31	33	27	34	12	24
29	19	25	22	28	31	27	39	33	31	33	33	22
30	19	.....	25	28	30	27	33	35	32	31	30	22
31	19	.....	25	.....	28	.....	28	35	.....	32	.....	22
1913.												
1	22	24	12	31	31	26	32	29	34	28	31	.....
2	22	24	12	31	33	30	34	31	31	28	31	.....
3	21	23	12	31	33	30	32	31	31	26	31	.....
4	22	23	11	31	33	26	31	28	31	26	26	.....
5	22	22	11	30	32	26	31	28	31	26	25	.....
6	22	25	24	29	33	28	31	28	34	30	25	.....
7	22	30	33	28	32	24	31	28	32	32	25	.....
8	28	28	31	28	32	25	31	28	31	35	25	.....
9	28	16	28	31	31	29	30	31	30	32	25	.....
10	29	16	28	31	30	25	30	28	30	30	26	.....
11	30	16	28	30	33	25	28	26	30	30	26	.....
12	31	16	28	30	33	25	32	26	28	32	29	.....
13	33	16	28	31	33	31	32	32	31	34	26	11
14	30	15	28	31	30	31	32	32	30	34	30	11
15	31	15	28	31	30	31	32	32	29	32	30	11
16	33	15	28	31	30	31	30	34	29	32	30	11
17	28	15	28	31	27	28	30	26	29	32	30	11
18	24	13	28	31	25	29	30	26	28	31	30	11
19	22	12	30	31	24	31	30	29	28	31	30	14
20	22	12	31	30	24	31	31	30	28	31	30	14
21	22	12	31	30	21	31	31	34	28	32	29	14
22	35	12	33	28	21	31	28	34	29	32	19	14
23	31	12	33	30	21	31	29	32	28	32	19	16
24	31	15	31	31	21	29	36	31	28	32	19	16
25	28	12	32	33	21	31	36	31	28	32	18	16
26	28	12	31	33	27	31	36	29	28	32	18	16
27	27	12	30	31	25	31	34	29	26	32	18	16
28	27	12	30	31	26	32	32	29	27	32	18	20
29	24	.....	29	31	29	32	31	35	29	32	18	23
30	23	.....	29	33	29	32	31	34	30	31	18	24
31	22	.....	29	.....	29	.....	31	34	.....	31	.....	24

NOTE.—Channel dry Jan. 3–21, Nov. 23–25, 1912; Dec. 1–12, 1913.

Monthly discharge of Kanaha ditch near Lihue, Kauai, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
January	24	0	8.23	506	A.
February	28	19	23.2	1,330	A.
March	31	22	26.4	1,620	A.
April	30	16	25.2	1,500	A.
May	33	25	28.3	1,740	A.
June	30	27	27.8	1,650	A.
July	39	28	30.9	1,900	A.
August	39	27	33.3	2,050	A.
September	35	27	31.2	1,860	A.
October	35	30	32.6	2,000	A.
November	35	0	26.9	1,600	A.
December	35	10	23.2	1,430	A.
The year	39	0	26.5	19,200	
1913.					
January	35	21	26.4	1,620	A
February	30	12	17.0	944	A.
March	33	11	26.6	1,640	A.
April	33	28	30.6	1,820	A.
May	33	21	27.4	1,680	A.
June	32	24	29.1	1,730	A.
July	36	28	31.5	1,940	A.
August	35	26	30.2	1,860	A.
September	34	26	29.5	1,760	A.
October	35	26	31.0	1,910	A.
November	31	18	25.2	1,500	A.
December 13–31	24	0	9.45	581	A.
The year	36	0	26.2	19,000	

EAST BRANCH OF NORTH FORK OF WAILUA RIVER, NEAR LIHUE, KAUAI.

Location.—About 8 miles north of Lihue, 600 feet above gaging station on the North Fork of Wailua, and 400 feet above the confluence of the North and East branches of the North Fork of Wailua River.

Records available.—July 27, 1912, to December 31, 1913.

Drainage area.—6.2 square miles.

Gage.—Inclined staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Accuracy.—Records fair except for November, when broken records were obtained.

Discharge measurements of East Branch of North Fork of Wailua River near Lihue, Kauai, in 1913.

Date.	Hydrographer.	Gage height	Discharge.
		Feet.	*Sec.-ft.*
Jan. 19	D. E. Horner	6.50	46.7
May 29	W. V. Hardy	6.30	30.7

Daily discharge, in second-feet, of East Branch of North Fork of Wailua River, near Lihue, Kauai, for 1912–13.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.							1912.						
1	.....	26	32	41	34	66	16	.....	36	20	24	26	32
2	.....	25	41	82	28	49	17	.....	32	20	32	23	32
3	.....	24	36	82	26	31	18	.....	25	20	28	26	32
4	.....	23	32	26	37	14	19	.....	28	20	43	39	30
5	.....	22	32	24	48	14	20	.....	26	24	32	32	55
6	.....	32	52	22	41	100	21	.....	24	23	66	48	14
7	.....	36	36	23	36	69	22	.....	24	23	41	63	179
8	.....	32	30	36	38	68	23	.....	24	20	36	76	69
9	.....	32	32	28	59	56	24	.....	23	19	34	30	65
10	.....	26	26	26	96	55	25	.....	26	18	33	28	62
11	.....	24	24	100	34	53	26	.....	32	17	39	26	58
12	.....	24	24	36	26	51	27	28	52	17	34	24	52
13	.....	24	24	30	26	43	28	28	32	18	37	36	50
14	.....	28	23	28	24	41	29	28	32	19	39	47	24
15	.....	32	21	26	26	30	30	36	41	20	40	59	36
							31	27	36	.....	39	.....	36

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	34	30	23	41	41	35	41	29	42	18	70	133
2	32	29	24	41	36	24	47	26	42	18	110	123
3	32	28	23	41	36	42	53	22	43	17	30	113
4	30	26	18	36	32	69	59	24	44	17	32	102
5	39	26	18	32	41	52	56	24	36	16	30	92
6	30	24	20	25	66	45	36	25	40	36	32	82
7	28	32	28	30	59	43	34	24	44	56	44	82
8	32	41	32	36	41	40	32	24	32	50	36	62
9	32	33	21	36	32	46	30	32	28	43	27	55
10	39	41	31	41	32	48	28	24	24	36	32	52
11	46	36	24	26	34	42	32	26	26	34	43	50
12	74	36	24	24	52	41	32	24	24	46	43	48
13	71	27	23	26	46	46	35	35	24	45	44	41
14	66	26	24	63	41	41	31	36	24	44	44	112
15	79	26	24	100	41	36	30	38	24	42	44	34
16	59	35	18	83	46	52	26	41	23	41	45	32
17	55	28	20	66	52	35	24	27	23	36	61	30
18	52	28	23	52	58	34	30	32	20	35	76	28
19	41	28	26	52	41	34	30	26	20	33	92	27
20	41	28	28	44	35	32	26	24	20	32	108	26
21	41	32	29	41	34	28	36	35	32	32	123	24
22	24	31	30	44	32	26	26	24	26	41	139	26
23	56	30	32	46	32	28	24	27	20	40	154	24
24	100	32	24	43	32	26	29	30	19	36	170	24
25	52	28	17	41	32	26	24	24	19	34	151	24
26	40	26	12	32	30	26	52	24	18	33	132	24
27	41	24	28	32	30	32	32	24	18	32	114	24
28	32	23	44	32	28	58	32	24	31	37	95	20
29	32	.....	41	41	24	30	32	56	26	36	82	23
30	31	.....	34	52	17	43	30	46	22	32	143	20
31	30	.....	41	.....	24	.....	26	41	.....	30	.....	20

NOTE.—Discharge estimated for following days on which no gage heights were recorded: 1912: Aug. 14; Sept. 13; Nov. 4. 21, 25, 28, and 29; Dec. 2, 3, 11, 24, and 25; 1913: Jan. 1, 10, and 30; Feb. 3, 7, and 19; Mar. 17–19, 24, and 27; Apr. 4, 7, 14, 16. and 22; June 3 and 18; July 2, 3, and 28; Aug. 15 and 23; Sept. 1–3, 6, 15, 22, 29, and 30; Oct. 6, 15, 20, and 26; Nov. 1, 12–14, 17–23, and 25–27; Dec. 1–5, 16, 19, and 25.

Monthly discharge of East Branch of North Fork of Wailua River near Lihue, Kauai, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
July 27–31	36	27	29.4	291	B.
August	52	22	29.2	1,800	B.
September	52	17	25.4	1,510	B.
October	100	22	39.0	2,400	B.
November	96	23	38.7	2,300	B.
December	179	14	50.5	3,110	B.
1913.					
January	100	28	44.9	2,760	B.
February	41	23	29.8	1,660	B.
March	44	12	25.9	1,590	B.
April	100	24	43.3	2,580	B.
May	66	17	38.0	2,340	B.
June	69	24	38.7	2,300	B.
July	59	24	34.0	2,090	B.
August	56	22	29.6	1,820	B.
September	44	18	27.8	1,650	B.
October	56	16	34.8	2,140	B.
November	170	27	78.2	4,650	C.
December	133	20	50.9	3,130	B.
The year	170	12	39.7	28,700	

KONOHIKI STREAM AT MAKAKUALELE WEIR (MAUKA), NEAR KEALIA, KAUAI.

Location.—About 5 miles southwest of Kealia.

Records available.—April 1, 1911, to December 31, 1913.

Gage.—Vertical staff.

Discharge measurements.—Made with 3-foot sharp-crested weir.

Cooperation.—Station maintained and daily-discharge record furnished by the Makee Sugar Co.

Discharge, in million gallons per day, of Konohiki Stream at Makakualele weir (mauka), near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.38	0.38	0.45	0.54	0.49	0.54	0.86	0.67	0.67	0.58	0.62	1.95
2	.38	.38	.45	.54	.49	.54	.86	.67	.67	.58	.62	2.79
3	.38	.38	.45	.54	.49	3.79	.86	.67	1.16	.54	.62	3.01
4	.38	.38	.41	.49	.49	2.79	.86	.67	.96	.58	.62	3.01
5	.38	.38	.41	.49	.49	2.21	.86	.67	.67	.58	.62	2.29
6	.38	1.17	.41	.49	.49	1.64	.81	.67	.67	.49	.71	2.09
7	.38	.96	.41	.49	.54	1.28	.81	.62	.67	.49	.71	2.09
8	.38	.49	.41	.49	.54	1.17	.81	.62	.67	.49	.71	2.71
9	.38	.45	.41	.49	.54	1.40	.81	.62	.67	.62	.71	2.71
10	.38	.41	.41	.49	.49	1.17	.81	.62	.62	.62	.62	2.21
11	.38	.45	.41	.49	.49	1.06	.81	.62	.62	.54	.58	2.09
12	.38	.41	.41	.49	1.06	1.01	.81	.62	.62	.54	.58	2.02
13	.38	.41	.41	.49	1.17	1.01	.96	.71	.58	.54	.58	1.89
14	.38	.41	.45	.49	.91	.96	.86	.71	.58	.54	.58	1.83
15	.38	.41	.41	.54	.67	.96	.86	.71	.58	.54	.54	1.83
16	.38	.41	.41	.49	.58	.96	.81	.71	.58	.54	.54	1.76
17	.38	.41	.41	.49	.62	.96	.81	.67	.58	.86	.54	1.64
18	.38	.67	.41	.49	.58	.96	.81	.67	.58	.71	.54	1.52
19	.38	.58	.41	.49	.58	.96	.81	.67	.58	.71	.62	1.52
20	.38	.45	.41	.49	.49	.96	.81	.67	.58	.67	.76	1.64
21	.38	.45	.41	.49	.49	.86	.81	.67	.58	.58	18.3	1.52
22	.38	.45	.41	.49	.49	.86	.81	.58	.58	.58	6.47	1.52
23	.38	.45	.58	.49	.58	.86	.76	.58	.58	.62	2.57	1.46
24	.38	.49	1.34	.49	.58	.86	.....	.62	.58	.76	2.57	1.46
25	.38	.45	.91	.49	.58	.86	.....	.67	.58	.67	2.36	1.46
26	.38	.45	.81	.49	.58	.86	.....	.58	.58	.67	1.95	1.40
27	.38	.45	.71	.49	.54	.96	.....	.67	.58	.62	1.95	1.40
28	.38	.45	.62	.49	.54	.96	.71	.67	.76	.62	1.95	1.34
29	.38	.....	.62	.49	.54	.86	.71	.67	.58	.76	.62	1.34
30	.38	.....	.62	.49	.54	.86	.67	.67	.58	.67	.62	1.34
31	.34	.....	.54	.....	.54	.....	.67	.67	.....	.67	.....	1.34

NOTE.—No record July 24–27.

Monthly discharge of Konohiki Stream at Makakualele weir (mauka), near Kealia, Kauai, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	0.38	0.34	0.38	36
February	1.17	.38	.47	40
March	1.34	.41	.51	49
April	.54	.49	.50	46
May	1.17	.49	.59	56
June	3.79	.54	1.17	108
July 1–23, 28–31	.86	.67	.81	67
August	.71	.58	.66	63
September	1.16	.58	.64	59
October	.86	.49	.61	58
November	18.3	.54	1.72	158
December	3.01	1.34	1.88	179
The period (361 days)	18.3	.34	.83	919

NOTE.—Mean for July is for 27 days.

SOUTH FORK OF KAEHULUA STREAM AT WAINAMUAMU WEIR, NEAR KEALIA, KAUAI.

Location.—About 5 miles southwest of Kealia.

Records available.—April 1, 1911, to December 31, 1913.

Gage.—Vertical staff.

Discharge measurements.—Made with a 3-foot sharp-crested weir.

Cooperation.—Station maintained and daily-discharge record furnished by the Makee Sugar Co.

Discharge, in million gallons per day, of South Fork of Kaehulua Stream at Wainamuamu weir, near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.30	0.27	0.30	0.30	0.30	0.27	0.38	1.64	0.58	0.49	0.62	0.58
2	.30	.27	.30	.30	.30	.27	.38	.91	.67	.49	.67	.58
3	.30	.27	.30	.30	.30	1.34	.38	.38	.67	.45	.58	.58
4	.30	.27	.30	.30	.30	1.06	.38	.38	.67	.41	.58	.58
5	.30	.27	.30	.30	.30	.86	.38	.38	.58	.41	.58	.58
6	.30	.58	.30	.30	.30	.76	.34	.38	.58	.41	.58	.58
7	.30	.49	.30	.30	.30	.49	.....	2.29	.58	.45	.58	.58
8	.30	.41	.30	.30	.30	.49	.....	.38	.58	.45	.58	.58
9	.30	.38	.30	.30	.30	.45	.....	.38	.58	.58	.58	.58
10	.30	.38	.30	.30	.30	.45	.....	.38	.58	.58	.58	.58
11	.27	.34	.30	.30	.30	.41	.....	.38	.58	.58	.58	.58
12	.27	.34	.30	.30	.45	.41	.....	.38	.58	.58	.58	.58
13	.27	.34	.30	.30	.49	.41	.41	.38	.54	.58	.58	.58
14	.27	.34	.30	.30	.81	.38	.34	.58	.54	.58	.58	.58
15	.27	.34	.30	.30	.34	.38	.....	.58	.54	.58	.58	.58
16	.27	.34	.30	.30	.30	.38	.....	.58	.54	.58	.58	.58
17	.27	.30	.30	.30	.30	.38	.....	.58	.54	.96	.58	.58
18	.27	.38	.30	.30	.30	.38	.....	.49	.54	.76	.58	.58
19	.27	.34	.30	.30	.30	.38	.....	.45	.54	.76	.58	.58
20	.27	.30	.30	.30	.30	.38	.....	.45	.54	.71	.58	.58
21	.27	.30	.30	.30	.30	.38	.....	.45	.54	.62	.58	.58
22	.27	.30	.30	.30	.30	.38	.....	.62	.54	.58	.58	.58
23	.27	.30	.41	.30	.30	.38	.30	.62	.49	.67	.58	.58
24	.27	.34	.58	.30	.30	.38	1.17	.62	.49	.81	.58	.58
25	.27	.30	.54	.30	.30	.38	.34	.62	.49	.71	.58	.58
26	.27	.30	.41	.30	.30	.38	.34	.58	.49	.71	.58	.58
27	.27	.30	.38	.30	.27	.38	.34	.58	.58	.67	.58	.58
28	.27	.30	.34	.30	.27	.38	1.70	.58	.62	.58	.58	.58
29	.27	.....	.34	.30	.27	.38	.34	.58	.49	.71	.58	.58
30	.27	.....	.34	.30	.27	.38	.34	.58	.49	.76	.58	.58
31	.27	.....	.30	.30	.27	.....	.30	.58	.....	.76	.....	.58

NOTE.—No record July 7–12, 15–22.

Monthly discharge of South Fork of Kaehulua Stream at Wainamuamu weir, near Kealia, Kauai, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	0.30	0.27	0.28	27
February	.58	.27	.34	29
March	.58	.30	.33	31
April	.30	.30	.30	28
May	.81	.27	.32	31
June	1.34	.27	.46	42
July 1–6, 13–14, 23–31	1.70	.30	.48	25
August	2.29	.38	.61	58
September	.67	.49	.56	52
October	.96	.41	.61	58
November	.67	.57	.58	54
December	.58	.58	.58	55
The period (351 days)	2.29	.27	.45	490

KAEHULUA STREAM AT KUHINOA WEIR, NEAR KEALIA, KAUAI.

Location.—About 3 miles southwest of Kealia.

Records available.—May 1, 1911, to December 31, 1913.

Gage.—Vertical staff.

Discharge measurements.—Made with 6.5-foot sharp-crested weir.

Cooperation.—Station maintained and daily-discharge record furnished by Makee Sugar Co.

Discharge, in million gallons per day, of Kaehulua Stream at Kuhinoa weir, near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.04	0.12	0.44	0.12	0.44	0.12	0.21	0.12	0.11	0.07	0.44	6.52
2	.04	.12	.12	.12	.38	.12	.26	.12	.11	.07	.44	4.96
3	.04	.12	.12	.12	.26	9.14	.81	.12	.12	.07	.32	6.52
4	.04	.12	.12	.12	.21	9.14	.66	.12	.12	.07	.26	5.72
5	.07	.12	.12	.12	.12	11.1	.58	.12	.12	.07	.26	3.55
6	.07	.44	.12	.12	.12	3.96	.73	.12	.12	.12	.26	3.55
7	.11	.44	.12	.12	.26	3.82	.44	.12	.12	.12	.44	3.55
8	.12	.44	.12	.12	.12	1.26	.38	.12	.12	.12	.51	4.96
9	.07	.44	.12	.12	.21	1.16	.26	.12	.12	.12	.51	4.23
10	.12	.44	.12	.12	.21	.90	.26	.12	.12	.12	.44	4.38
11	.12	.44	.12	.04	.21	.58	.26	.12	.11	.12	.32	3.82
12	.12	.44	.12	.04	.81	.44	.26	.11	.11	.12	.26	2.91
13	.12	.44	.12	.04	2.54	.38	.26	.11	.07	.12	.44	3.55
14	.12	.44	.12	.04	2.08	.32	.26	.07	.07	.12	.44	3.55
15	.12	.44	.12	.11	1.86	.38	.21	.07	.07	.12	.58	3.55
16	.26	.12	.12	.11	1.86	.51	.21	.07	.07	.12	.58	2.91
17	.44	.12	.12	.04	1.86	.32	.12	.07	.07	.32	.58	2.91
18	.44	.12	.12	.04	.81	.32	.12	.04	.07	.26	.58	3.55
19	.12	.12	.12	.07	.81	.32	.12	.04	.07	.26	.73	6.52
20	.12	.12	.12	.07	1.16	.32	.12	.04	.07	.21	1.07	3.55
21	.12	.12	.12	.07	.44	.32	.12	.04	.07	.21	39.7	3.55
22	.12	.12	.12	.12	.21	.26	.21	.04	.07	.21	14.0	3.55
23	.58	.24	.44	.12	.12	.21	.12	.04	.07	.44	6.52	3.55
24	.12	.24	.44	.32	.12	.32	.12	.04	.07	.44	6.52	2.91
25	.12	.24	.44	.26	.12	.26	.12	.04	.04	.44	4.96	2.91
26	.12	.24	.44	.26	.12	.21	.12	.04	.04	.44	1.26	2.91
27	.12	.24	.44	.21	.12	.12	.12	.04	.04	.44	.81	.44
28	.12	.24	.44	.21	.12	.12	.12	.04	.12	.44	.81	.44
29	.12	.....	.44	.21	.12	.12	.12	.04	.12	.58	.81	.44
30	.12	.....	.12	.32	.12	.21	.12	.04	.12	.58	.81	.44
31	.12	.....	.12	.....	.12	.....	.12	.04	.....	.58	.....	.44

Monthly discharge of Kaehulua Stream at Kuhinoa weir, near Kealia, Kauai, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	0.58	0.04	0.14	13
February	.44	.12	.26	22
March	.44	.12	.20	19
April	.32	.04	.13	12
May	2.54	.12	.58	55
June	11.1	.12	1.56	144
July	.81	.12	.26	25
August	.12	.04	.08	8
September	.12	.04	.09	8
October	.58	.07	.24	23
November	39.7	.26	2.86	263
December	6.52	.44	3.43	326
The year	39.7	.04	.82	918

NORTH FORK OF KEAHULUA STREAM AT KAINAHOLA WEIR, NEAR KEALIA, KAUAI.

Location.—About 3 miles southwest of Kealia.

Records available.—April 1, 1911, to December 31, 1913.

Gage.—Vertical staff.

Discharge measurements.—Made with 3-foot sharp-crested weir.

Cooperation.—Station maintained and daily-discharge record furnished by the Makee Sugar Co.

Daily discharge, in million gallons per day, of North Fork of Kaehulua Stream at Kainahola weir, near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.81
2	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.58
3	.41	.41	.41	.41	.41	.96	.41	.41	.49	.41	.41	.62
4	.41	.41	.41	.41	.41	.58	.41	.41	.41	.41	.41	1.01
5	.41	.41	.41	.41	.41	.58	.41	.41	.41	.41	.41	.81
6	.41	.49	.41	.41	.41	.49	.41	.41	.41	.41	.41	.58
7	.41	.54	.41	.41	.41	.49	.41	.41	.41	.41	.41	.49
8	.41	.45	.41	.41	.41	.41	.41	.41	.41	.41	.41	.49
9	.41	.41	.41	.41	.49	.41	.41	.41	.41	.41	.49	.41
10	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41
11	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.41	.41
12	.41	.41	.38	.49	.45	.41	.41	.41	.41	.41	.41	.41
13	.41	.41	.38	.49	.41	.41	.41	.41	.41	.41	.41	.41
14	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.41	.41
15	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.41	.41
16	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.41	.41
17	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.41	.41
18	.41	.58	.38	.41	.41	.41	.41	.41	41	.41	.41	.41
19	.41	.45	.38	.41	.41	.41	.41	.41	.41	.41	.41	.41
20	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.58	.41
21	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.67	.41
22	.41	.41	.38	.41	.41	.41	.41	.41	.41	.41	.62	.41
23	.41	.41	.58	.41	.41	.41	.41	.41	.41	.41	.58	.41
24	.41	.41	.49	.41	.41	.41	.41	.41	.41	.41	.58	.41
25	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.58	.41
26	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.49	.41
27	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41
28	.41	.41	.41	.41	.41	.41	.41	.41	.58	.41	.41	.41
29	.41	.....	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41
30	.41	.....	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41
31	.41	.....	.41	.41	.41	.....	.41	.41	.....	.41	.....	.41

Monthly discharge of North Fork of Kaehulua Stream at Kainahola weir, near Kealia, Kauai, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	0.41	0.41	0.41	39
February	.58	.41	.43	37
March	.58	.38	.41	39
April	.49	.41	.42	39
May	.49	.41	.41	39
June	.96	.41	.44	41
July	.41	.41	.41	39
August	.41	.41	.41	39
September	.58	.41	.42	39
October	.41	.41	.41	39
November	.67	.41	.45	41
December	1.01	.41	.48	46
The year	1.01	.38	.42	477

KAPAA RIVER NEAR KEALIA, KAUAI.

Location.—About 1 mile above intake of Kapahi ditch and 5 miles northwest of Kealia.

Records available.—July 23, 1910, to December 31, 1913.

Drainage area.—3.6 square miles.

Gage.—Vertical staff.

Control.—Fairly permanent.

Discharge measurements.—Made from wire suspension footbridge or by wading.

Accuracy.—Records good except for November and December, when records were fair.

Cooperation.—Station is maintained in cooperation with the Makee Sugar Co.

The following discharge measurement was made by W. V. Hardy:
May 20, 1913: Gage height, 1.54 feet; discharge, 14.1 second-feet.

Daily discharge, in second-feet, of Kapaa River near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	17	12	12	22	13	16	23	14	32	13	15	27
2	20	12	12	20	30	153	54	15	20	13	34	21
3	15	12	12	23	14	155	24	14	44	13	24	220
4	13	12	11	20	16	78	33	13	18	13	18	139
5	13	12	11	16	13	38	33	13	17	12	18	42
6	14	158	12	14	32	38	19	13	32	23	16	60
7	18	46	24	13	23	24	17	17	20	37	36	38
8	28	21	14	13	51	20	16	16	17	30	22	29
9	19	16	13	24	27	42	17	21	16	48	115	22
10	20	14	12	17	17	23	14	16	15	17	48	20
11	17	15	11	22	16	32	15	14	14	20	44	18
12	42	13	11	14	48	20	19	17	16	19	64	17
13	96	13	13	31	115	23	33	23	14	26	60	17
14	26	12	12	45	36	22	24	41	14	19	26	16
15	21	13	11	35	21	21	17	19	14	20	20	15
16	51	14	14	20	32	24	17	31	14	18	21	13
17	21	13	13	52	39	18	16	18	13	16	21	13
18	17	86	13	29	33	18	14	14	13	36	31	14
19	16	36	13	23	19	16	19	14	13	17	71	13
20	14	36	16	17	16	14	19	14	13	15	127	13
21	64	18	19	17	15	14	17	21	15	38	631	13
22	46	18	26	17	14	14	14	17	14	168	121	13
23	19	32	95	19	13	14	14	16	13	29	62	13
24	20	28	105	15	16	13	16	17	13	20	76	12
25	18	16	121	19	16	13	22	21	12	20	127	12
26	16	14	62	14	14	22	28	21	12	18	67	12
27	16	13	24	13	13	49	27	16	12	16	51	12
28	14	13	20	13	16	37	16	22	48	41	39	12
29	14	.....	18	15	14	20	34	44	13	21	26	12
30	13	.....	18	15	28	37	18	34	14	17	62	12
31	12	.....	18	.....	15	.....	17	30	.....	16	.....	12

Monthly discharge of Kapaa River near Kealia, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	96	12	24.2	1,490	A.
February	158	12	25.6	1,420	A.
March	121	11	25.4	1,560	A.
April	52	13	20.9	1,240	A.
May	115	13	25.3	1,560	A.
June	155	13	34.3	2,040	A.
July	54	14	21.5	1,320	A.
August	44	13	19.9	1,220	A.
September	48	12	17.8	1,060	A.
October	168	12	26.7	1,640	A.
November	631	15	69.8	4,150	B.
December	220	12	29.1	1,790	B.
The year	631	11	28.2	20,500	

AKULIKULI SPRING NEAR KEALIA, KAUAI.

Location.—About 5 miles west of Kealia.

Records available.—April 1, 1911, to December 31, 1913.

Gage.—Vertical staff.

Discharge measurements.—Made with a 3-foot sharp-crested weir.

Cooperation.—Station maintained and daily-discharge record furnished by the Makee Sugar Co.

Discharge, in million gallons per day, of Akulikuli Spring near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.67	0.62	0.67	0.67	0.67	0.58	0.67	0.67	0.76	0.67	0.67	1.06
2	.67	.62	.67	.67	.67	.58	1.76	.67	.71	.67	.67	.81
3	.67	.62	.62	.67	.67	4.22	1.34	.67	1.64	.67	.67	1.64
4	.67	.62	.58	.67	.67	3.63	1.34	.67	1.28	.62	.67	1.95
5	.67	.62	.58	.67	.67	2.64	.96	.67	.67	.58	.67	1.34
6	.67	1.59	.58	.67	.67	1.95	.81	.67	.67	.58	.67	1.17
7	.67	2.08	.58	.67	1.06	1.06	.81	.67	.67	.67	.76	1.06
8	.67	.81	.58	.67	.81	.96	.67	.67	.67	.67	.67	.96
9	.67	.67	.58	.67	1.34	1.06	.67	.67	.67	.67	.71	.81
10	.67	.67	.58	.67	.81	.81	.67	.67	.67	.67	.67	.81
11	.67	.67	.58	.67	.67	.71	.67	.67	.67	.67	.67	.81
12	.76	.67	.58	.67	1.34	.67	.67	.67	.67	.67	.67	.76
13	.71	.67	.58	.67	1.52	.67	.81	.67	.67	.67	.67	.67
14	.71	.67	.58	.67	.81	.67	.76	.67	.67	.67	.67	.67
15	.67	.67	.58	.96	.81	.67	.67	.81	.67	.67	.67	.67
16	3.39	.67	.58	.76	.81	.67	.67	.81	.67	.67	.67	.67
17	1.06	.67	.58	1.52	.91	.67	.67	.76	.67	.67	.67	.67
18	.76	2.21	.58	.86	.81	.67	.67	.67	.67	.67	.67	.67
19	.76	.91	.58	.67	.71	.67	.67	.67	.62	.67	.67	.67
20	.67	.81	.58	.67	.67	.67	.67	.67	.62	.67	.81	.67
21	.71	.67	.58	.67	.67	.67	.67	.67	.62	.67	2.43	.67
22	.71	.67	.71	.67	.67	.67	.67	.67	.62	.67	1.34	.67
23	.67	.71	2.36	.67	.67	.67	.67	.67	.62	.76	1.06	.67
24	.67	.96	1.06	.67	.67	.67	.67	.67	.62	.67	.96	.67
25	.67	.67	.81	.67	.67	.67	.67	.67	.62	.67	1.06	.67
26	.67	.67	.81	.67	.67	.67	.67	.67	.62	.67	.81	.67
27	.67	.67	.71	.67	.58	.67	.67	.67	.62	.67	.67	.67
28	.67	.67	.71	.67	.58	1.23	.67	.67	.96	1.23	.67	.67
29	.67	-------	.71	.67	.58	.91	.67	.67	.67	1.28	.67	.67
30	.62	-------	.67	.67	.58	.81	.67	.67	.67	.67	.67	.67
31	.62	-------	.67	-------	.58	-------	.67	.67	-------	.67	-------	.67

Monthly discharge of Akulikuli Spring near Kealia, Kauai, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	3.39	0.62	0.78	74
February	2.21	.62	.83	71
March	2.36	.58	.70	67
April	1.52	.67	.72	66
May	1.52	.58	.78	74
June	4.22	.58	1.06	98
July	1.76	.67	.77	73
August	.81	.67	.68	65
September	1.64	.62	.72	66
October	1.28	.58	.70	67
November	2.43	.67	.80	74
December	1.95	.67	.84	80
The year	4.22	.58	.78	875

KAPAHI DITCH AT KAPAHI, NEAR KEALIA, KAUAI.

Location.—About 4 miles west of Kealia and 500 feet below diversion dam on Kapaa River.

Records available.—April 15, 1909, to December 31, 1913.

Gage.—Watson water-stage recorder.

Discharge measurements.—There is a 20-foot sharp-crested weir immediately below the gage, but current-meter measurements give a different rating from the weir formula, and the meter rating is used.

Diversion.—Ditch diverts part of flow of Kapaa River.

Accuracy.—Records good.

Cooperation.—Station is maintained in cooperation with the Makee Sugar Co.

Daily discharge, in second-feet, of Kapahi ditch at Kapahi, near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	16.9	10.6	11.2	14.2	10.0	14.8	26.0	14.2	20.0	11.8	12.4	36.0
2	27.0	10.6	10.6	17.6	22.4	23.2	71.0	14.2	18.4	11.2	18.4	24.0
3	14.8	10.6	10.0	15.5	14.8	93.0	29.0	12.4	16.2	10.6	22.4	10.6
4	13.0	10.6	9.0	13.6	14.8	6.0	31.0	11.8	21.6	10.0	16.2	9.5
5	12.4	10.6	9.5	14.2	13.0	10.0	27.0	11.2	33.5	10.0	15.5	7.5
6	14.2	138	10.0	13.0	45.0	12.4	20.0	11.8	27.0	17.6	14.2	7.5
7	19.2	60.0	18.4	12.4	36.0	12.4	16.9	17.6	18.4	24.0	24.0	20.8
8	27.0	17.6	16.9	11.8	43.5	18.4	14.8	14.2	15.5	31.0	20.8	36.0
9	20.0	16.2	13.0	22.4	30.0	17.6	16.2	18.4	13.6	33.5	17.6	27.0
10	20.0	14.8	10.6	16.2	18.4	14.2	13.6	14.2	12.4	35.0	16.2	22.4
11	24.0	16.2	9.5	20.0	38.5	17.6	13.6	13.0	12.4	19.2	24.0	20.0
12	46.5	13.0	9.5	14.2	18.4	20.0	16.2	16.9	14.2	16.9	20.8	18.4
13	72.0	10.6	10.0	42.5	5.0	23.2	37.5	22.4	11.8	21.6	20.8	17.6
14	32.5	10.6	10.0	60.0	3.5	23.2	28.0	16.9	12.4	18.4	21.6	16.9
15	31.0	13.0	9.5	59.0	3.5	21.6	17.6	15.5	12.4	20.8	18.4	16.2
16	51.0	14.2	11.8	21.6	5.5	26.0	16.9	14.8	11.8	16.2	14.8	14.8
17	24.0	11.8	11.2	42.5	7.0	18.4	14.8	13.6	11.2	14.8	18.4	14.8
18	16.9	66.0	10.6	45.0	7.0	16.9	13.6	13.0	11.2	22.4	18.4	16.2
19	14.8	43.5	10.0	27.0	11.2	15.5	26.0	14.2	11.2	16.2	19.2	14.8
20	14.2	26.0	13.0	17.6	12.4	14.2	20.8	13.6	11.2	13.0	11.8	14.2
21	54.0	20.0	17.6	16.2	12.4	14.2	15.5	32.5	10.6	38.5	14.2	14.8
22	26.0	18.4	25.0	16.2	13.6	13.6	13.6	17.6	12.4	82.0	14.8	14.2
23	17.6	48.0	74.0	17.6	13.0	13.6	12.4	30.0	11.8	31.0	14.2	13.6
24	29.0	36.0	60.0	13.6	16.9	13.0	15.5	17.6	11.2	20.0	13.6	13.6
25	25.0	15.5	7.0	20.0	16.2	13.0	21.6	38.5	10.6	18.4	12.4	13.0
26	17.6	13.6	7.5	14.2	13.6	19.2	23.2	23.2	10.6	16.2	13.0	13.0
27	15.5	12.4	6.5	12.4	13.6	45.0	24.0	43.5	10.6	13.6	32.5	13.0
28	14.2	11.8	7.0	11.8	15.5	31.0	16.2	16.9	40.0	43.5	53.0	13.0
29	13.0	.....	12.4	14.2	13.6	25.0	36.0	14.8	12.4	23.2	16.2	13.0
30	12.4	.....	7.5	14.2	24.0	42.5	16.9	23.2	11.8	15.5	15.5	13.0
31	10.6	.....	13.6	.....	14.2	.....	15.5	27.0	.....	14.2	.....	13.0

Monthly discharge of Kapahi ditch at Kapahi, near Kealia, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	72.0	10.6	24.1	1,480	A.
February	138	10.6	25.0	1,390	A.
March	74.0	6.5	14.9	916	A.
April	60.0	11.8	21.7	1,290	A.
May	45.0	3.5	17.0	1,050	A.
June	93.0	6.0	21.6	1,290	A.
July	71.0	12.4	22.0	1,350	A.
August	43.5	11.2	18.7	1,150	A.
September	40.0	10.6	15.3	910	A.
October	82.0	10.0	22.3	1,370	A.
November	53.0	11.8	18.8	1,120	A.
December	36.0	7.5	16.5	1,010	A.
The year	138	3.5	19.8	14,300	

KANEHA DITCH NEAR KEALIA, KAUAI.

Location.—About 5 miles northwest of Kealia, a short distance below the outlet from the Kaneha reservoir.

Records available.—January 1, 1909, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—Made with a 20-foot sharp-crested weir.

Accuracy.—Records poor.

Cooperation.—Station is maintained in cooperation with the Makee Sugar Co.

Daily discharge, in second-feet, of Kaneha ditch near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.9	.....	.....	.....	4.8	5.6	5.2	20	3.6	6.0	5.6
2	.....	1.9	.....	.....	.....	2.2	5.2	6.8	10	3.2	5.6	5.6
3	.....	2.2	.....	.....	.....	12	5.2	7.8	8.8	3.2	12	6.8
4	.....	16	.....	.....	.....	35	5.6	7.3	13	.....	8.3	10
5	3.6	.....	.....	.....	.....	26	6.4	6.8	22	.....	6.4	7.3
6	4.0	.....	.....	.....	.....	8.3	6.0	6.8	13	.....	4.8	8.3
7	.....	.....	.....	.....	.....	8.8	5.6	6.8	9.0	.....	4.4	7.8
8	.....	.....	.....	.....	.....	7.8	4.8	8.3	7.3	.....	5.2	8.8
9	.....	.....	.....	.....	.....	10	4.8	11	6.4	.....	4.0	7.3
10	.....	.....	.....	.....	.....	11	3.2	7.8	6.0	.....	3.6	6.4
11	.....	.....	.....	.....	.....	11	2.8	6.0	5.6	6.4	5.2	6.0
12	11	.....	.....	.....	.....	6.4	3.6	5.6	6.0	4.4	3.2	6.0
13	6.8	.....	.....	.....	.....	6.0	11	4.8	6.4	3.6	1.6	6.0
14	12	.....	.....	.....	.....	6.0	9.5	6.0	6.0	12	7.8	6.4
15	6.8	.....	.....	.....	.....	6.0	7.3	5.6	6.4	22	6.0	6.0
16	5.2	.....	.....	.....	.....	6.8	7.3	6.0	6.8	21	6.4	4.8
17	.....	.....	.....	.....	13	6.0	8.8	5.6	3.2	12	6.4	4.4
18	4.4	.....	.....	.....	11	5.6	8.6	4.8	2.8	7.3	6.0	4.4
19	4.4	.....	.....	.....	7.8	5.2	8.3	6.4	3.2	5.2	8.3	4.4
20	4.4	.....	.....	.....	5.2	4.8	6.8	7.3	3.2	6.4	6.4	3.6
21	8.3	.....	.....	.....	4.4	4.4	6.0	7.3	10	7.8	6.0	3.2
22	.....	.....	.....	.....	3.6	2.2	4.8	6.4	4.0	7.3	5.6	3.2
23	.....	5.2	.....	.....	3.2	4.0	6.0	5.2	3.6	9.0	6.0	3.2
24	.....	4.0	.....	.....	3.2	2.2	6.0	6.0	4.8	10	7.3	4.4
25	4.4	3.6	.....	.....	2.8	1.6	5.6	7.8	5.2	7.8	5.2	4.8
26	4.4	3.6	.....	.....	2.5	1.6	9.5	7.3	4.0	13	3.2	5.2
27	.....	3.6	.....	.....	2.5	11	10	7.8	3.2	14	1.9	4.8
28	.....	.....	.....	.....	2.5	6.4	8.3	10	4.4	.....	1.6	3.6
29	.....	.....	.....	.....	3.2	5.6	9.5	9.0	4.0	.....	20	2.5
30	.....	.....	.....	.....	4.0	6.8	7.3	13	3.6	.....	15	2.5
31	.....	.....	.....	.....	5.2	.....	5.2	8.8	.....	.....	.....	2.5

NOTE.—No record Jan. 1–4, 7–11, 17, 22–24, 27–31; Feb. 5–22; Feb. 28–May 16; Oct. 4–10, 28–31. Discharge interpolated May 18–20 and July 18.

Monthly discharge of Kaneha ditch near Kealia, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 5–6, 12–16, 18–21, 25–26	12	3.6	6.13	158	C.
February 1–4, 23–27	16	1.9	4.67	83	C.
May 17–31	13	2.5	4.94	147	C.
June	35	1.6	7.85	467	C.
July	11	2.8	6.60	406	C.
August	13	4.8	7.14	439	C.
September	22	2.8	7.06	420	C.
October 1–3, 11–27	22	3.2	8.96	355	C.
November	20	1.6	6.31	375	C.
December	10	2.5	5.35	329	C.
The period				3,180	

ANAHOLA RIVER ABOVE DAM AT KIOKALA, NEAR KEALIA, KAUAI.

Location.—About one-fourth mile above dam at Kiokala and 6 miles northwest of Kealia.

Records available.—August 22 to November 2, 1910; December 28, 1912, to December 31, 1913. December 15, 1910, to December 28, 1912, at dam at Kiokala.

Drainage area.—5.3 square miles.

Gage.—Friez water-stage recorder August 22 to November 2, 1910, and December 28, 1912, to December 31, 1913. From December 15, 1910, to December 28, 1912, an inclined staff gage.

Control.—Permanent.

Discharge measurements.—Made by wading and from foot bridge.

Accuracy.—Records good for January and from May to August; for other months fair.

Cooperation.—Station maintained in cooperation with the Makee Sugar Co.

The following discharge measurement was made by W. V. Hardy:

May 19, 1913: Gage height, 1.24 feet; discharge, 24.5 second-feet.

Daily discharge, in second-feet, of Anahola River above dam at Kiokala, near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	19	10	13	20	9.6	13	17	12	17	12	10	37
2	56	9.5	13	16	17	17	33	12	20	13	30	30
3	19	9.2	12	16	11	97	18	11	51	10	15	211
4	15	9.3	11	16	9.6	62	21	11	17	9.6	13	174
5	20	10	11	13	9.6	30	22	10	17	9.6	11	87
6	16	142	11	12	34	23	13	10	44	11	11	93
7	15	53	12	12	26	21	12	11	22	17	57	75
8	21	21	25	11	35	20	12	12	15	23	23	53
9	15	16	17	15	22	24	12	17	13	28	35	37
10	13	17	11	13	15	26	11	12	13	15	24	30
11	21	17	11	13	67	29	10	10	12	13	32	26
12	36	13	10	14	74	20	11	13	12	13	26	22
13	61	12	10	46	35	23	26	13	12	20	26	22
14	30	11	10	61	45	18	20	13	13	17	17	.....
15	28	12	10	48	29	17	13	15	18	20	15	.....
16	30	15	13	22	41	20	12	24	13	17	15	.....
17	19	11	10	36	41	18	11	15	12	13	16	.....
18	17	63	10	34	40	17	11	14	12	13	16	.....
19	15	52	10	27	26	15	14	12	14	11	46	.....
20	16	33	11	16	22	14	16	11	13	10	137	.....
21	28	23	17	15	20	13	12	16	13	12	176	.....
22	36	22	20	18	18	13	11	12	13	49	61	.....
23	16	34	127	18	17	13	11	11	12	57	52	.....
24	15	25	135	13	18	13	14	13	12	22	57	.....
25	19	20	136	14	18	13	30	22	11	17	89	.....
26	15	17	67	11	17	13	18	13	11	15	73	.....
27	15	15	39	9.9	16	28	31	17	11	13	49	.....
28	13	15	33	10	15	19	15	17	23	28	43	.....
29	12	.....	27	9.6	15	15	18	19	11	14	49	.....
30	12	.....	21	9.6	15	18	15	15	10	12	55	.....
31	11	.....	19	.....	14	.....	13	21	.....	12	.....	.....

NOTE.—No record Dec. 14–31. Discharge interpolated Mar. 28–29 and Nov. 29.

Monthly discharge of Anahola River above dam, at Kiokala, near Kealia, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	61	11	21.7	1,330	A.
February	142	9.2	25.2	1,400	B.
March	136	10	28.5	1,750	B.
April	61	9.6	19.6	1,170	B.
May	74	9.6	25.5	1,570	A.
June	97	13	22.7	1,350	A.
July	33	10	16.2	996	A.
August	24	10	14.0	861	A.
September	51	10	16.2	964	B.
October	57	9.6	17.6	1,080	B.
November	176	10	42.6	2,530	B.
December 1–13	211	22	69.0	1,780	B.
The period				16,800	

ANAHOLA DITCH AT KIOKALA, NEAR KEALIA, KAUAI.

Location.—About 6 miles northwest of Kealia.
Records available.—May 10, 1909, to December 31, 1913.
Gage.—Watson water-stage recorder.
Discharge measurements.—Made with 10-foot sharp-crested weir.
Accuracy.—Records good.
Cooperation.—Station maintained in cooperation with the Makee Sugar Co.

Daily discharge, in second-feet, of Anahola ditch at Kiokala, near Kealia, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.1	6.6	9.4	13.2	8.7	9.4	11.1	7.8	11.1	5.7	4.4	.....
2	13.6	6.3	8.7	12.5	11.8	9.4	12.5	7.8	10.1	6.6	7.8	.....
3	13.2	6.0	8.1	12.5	9.7	14.7	11.8	6.9	17.1	4.2	9.0	.....
4	11.8	6.0	7.8	12.1	8.7	13.6	11.8	6.6	17.2	3.4	7.5	.....
5	11.8	7.5	7.2	11.8	8.1	12.5	12.1	6.0	17.4	3.4	6.6	.....
6	12.1	15.9	8.1	11.1	11.8	11.8	10.4	5.5	17.5	4.7	5.7	.....
7	10.7	15.1	8.4	10.4	13.2	11.4	10.1	5.7	14.0	8.4	9.7	.....
8	12.8	12.8	10.7	10.1	14.0	11.1	9.4	7.2	10.7	12.1	10.1	.....
9	11.8	12.1	11.1	11.8	12.8	11.4	9.7	11.1	9.0	12.1	10.7	.....
10	11.8	11.4	7.8	10.7	12.1	11.8	8.4	7.8	7.8	8.7	10.1	.....
11	10.4	12.5	6.9	11.4	12.5	11.8	7.5	6.0	7.2	6.3	10.4	.....
12	13.2	10.1	6.3	10.1	16.7	11.1	7.5	7.8	6.0	6.3	10.1	.....
13	14.3	8.7	6.3	14.0	8.1	10.7	11.8	9.7	6.0	9.7	10.1	.....
14	12.8	11.4	6.0	14.7	.....	10.7	12.1	8.4	7.5	8.7	9.0	.....
15	12.5	9.0	6.0	15.1	.....	10.7	9.7	10.4	11.1	10.4	8.4	.....
16	13.2	10.4	8.4	13.2	.....	11.1	8.1	12.1	7.2	9.4	8.1	.....
17	11.4	8.4	6.3	13.6	4.2	10.7	7.2	10.4	6.0	6.3	8.7	.....
18	10.1	14.3	6.0	14.0	10.4	10.7	7.2	9.4	5.7	5.2	8.4	.....
19	9.4	12.5	5.5	13.2	10.1	10.4	8.7	6.9	6.9	4.7	10.1	.....
20	10.1	13.6	6.9	12.1	9.7	9.7	10.7	5.5	5.7	4.2	13.2	.....
21	11.4	12.5	10.7	12.1	9.7	9.0	7.8	8.7	6.3	6.0	.....	.....
22	14.0	12.5	11.4	12.5	9.7	9.0	6.9	6.0	5.7	9.7	.....	.....
23	11.8	13.2	6.0	12.1	9.4	8.7	6.9	5.2	5.5	14.7	.....	.....
24	10.7	12.8	.4	11.1	9.4	8.4	7.8	6.3	4.7	13.2	.....	.....
25	11.1	12.1	.1	11.1	9.4	8.7	14.0	12.5	4.4	11.8	.....	.....
26	11.1	11.4	.....	10.7	9.4	8.7	12.8	8.1	3.9	9.4	.....	.....
27	10.7	10.7	.....	9.4	9.0	10.1	14.3	9.0	4.2	7.2	.....	.....
28	8.7	9.7	.....	9.7	9.0	11.1	10.7	10.7	9.7	11.8	.....	.....
29	7.8	.....	5.5	9.4	8.7	10.4	12.5	12.1	5.7	8.1	.....	.....
30	7.5	.....	13.6	9.0	9.0	11.1	10.7	9.4	4.4	6.0	.....	.....
31	7.2	.....	13.2	.....	8.7	.....	9.4	11.8	.....	5.2	.....	.....

NOTE.—No record Mar. 26–28, May 14–16, and Nov. 21 to Dec. 31. Discharge Sept. 4 and 5 interpolated.

Monthly discharge of Anahola ditch at Kiokala, near Kealia, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	14.3	7.2	11.7	719	A.
February	15.9	6.0	10.9	605	A.
March	13.6	.1	7.60	422	A.
April	15.1	9.0	11.8	702	A.
May	16.7	4.2	10.1	563	A.
June	14.7	8.4	10.7	637	A.
July	14.3	6.9	10.1	621	A.
August	12.5	5.2	8.35	513	A.
September	17.5	3.9	8.52	507	A.
October	14.7	3.4	7.86	483	A.
November 1-20	13.2	4.4	8.90	353	A.
The period				6,120	

KALIHIWAI RIVER NEAR KILAUEA, KAUAI.

Location.—One-half mile below Hoopouli Falls, about 2 miles west of Kilauea, and about 5 miles above mouth of river. Reached by saddle horse on trail from Princeville ranch.

Records available.—August 21, 1912, to December 31, 1913.

Drainage area.—3.9 square miles.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Accuracy.—Records fair except for November and December, 1913, when they were poor.

Cooperation.—Station is maintained in cooperation with the Princeville ranch.

Discharge measurements of Kalihiwai River near Kilauea, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 18	D. E. Horner	6.76	114	Apr. 20	D. E. Horner	6.44	46.8
Apr. 19	do	6.62	76.8	May 23	W. V. Hardy	6.08	24.1

Daily discharge, in second-feet, of Kalihiwai River near Kilauea, Kauai, for 1912–13.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.						1912.					
1		29	24	25	28	16		25	25	24	36
2		32	24	24	36	17		25	24	24	39
3		29	23	24	76	18		25	24	29	44
4		29	22	24	2,500	19		58	29	25	41
5		29	22	25	224	20		58	46	111	36
6		46	23	32	76	21	29	24	76	29	36
7		32	24	24	46	22	124	23	25	28	36
8		29	98	24	46	23	36	23	29	25	52
9		29	36	32	41	24	29	24	36	27	46
10		29	25	24	41	25	29	22	32	25	46
11		29	24	24	38	26	29	22	34	25	44
12		29	24	24	36	27	98	22	32	24	41
13		27	24	24	36	28	36	22	29	27	36
14		25	24	24	46	29	41	22	28	29	35
15		25	23	25	41	30	36	23	27	25	34
						31	32		26		29

Daily discharge, in second-feet, of Kalihiwai River near Kilauea, Kauai, for 1912–13—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	29	24	24	36	41	18	41	25	36	22	25	400
2	29	23	24	36	87	18	36	24	1,050	21	25	264
3	28	23	24	36	63	98	52	24	46	21	25	1,450
4	27	24	23	36	38	46	41	23	38	21	24	224
5	29	24	23	27	25	29	35	23	32	21	25	154
6	36	750	23	26	264	25	35	23	30	21	26	187
7	36	98	24	25	46	25	32	23	30	37	31	180
8	41	36	25	24	62	26	32	22	29	32	32	174
9	36	29	23	32	41	32	31	24	32	31	37	50
10	48	24	22	29	36	30	30	24	30	29	39	46
11	46	24	22	32	50	29	29	24	29	27	50	41
12	187	23	22	32	80	29	29	41	27	25	400	39
13	98	23	22	34	36	27	48	48	26	25	500	36
14	58	22	22	67	32	32	46	41	25	25	187	34
15	52	23	22	62	46	36	38	36	25	24	154	31
16	46	24	23	54	62	36	38	27	24	24	111	29
17	41	24	23	111	80	36	36	26	32	24	76	29
18	38	244	24	119	38	32	29	24	32	24	62	29
19	98	154	23	85	29	30	27	23	24	23	700	28
20	98	46	23	52	29	29	26	23	32	36	1,100	28
21	111	29	25	38	26	27	25	24	24	32	550	28
22	98	29	32	38	25	27	32	24	24	29	650	27
23	76	29	348	46	25	25	24	24	23	72	400	24
24	58	29	390	41	24	24	24	24	23	58	308	24
25	41	24	400	80	23	24	52	24	23	36	600	24
26	32	27	308	63	22	23	41	24	23	29	187	24
27	29	25	76	46	21	244	32	24	22	24	154	23
28	25	111	58	41	21	41	29	27	22	28	124	23
29	24	.....	41	41	20	52	27	48	22	27	2,050	22
30	24	.....	41	39	19	41	26	39	22	27	600	22
31	24	.....	38	.....	18	.....	25	35	.....	26	.....	22

Monthly discharge of Kalihiwai River near Kilauea, Kauai, for 1912–13.

Month.	Discharge in second-feet.			Run-off (in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
August 21-31	124	29	47.2	1,030	B.
September	58	22	28.9	1,720	B.
October	98	22	31.0	1,910	B.
November	111	24	28.5	1,700	B.
December	2,500	28	127	7,810	B.
1913.					
January	187	24	53.0	3,260	A.
February	750	22	70.2	3,900	A.
March	400	22	71.5	4,400	A.
April	119	24	47.6	2,830	A.
May	264	18	46.1	2,830	A.
June	244	18	39.7	2,360	A.
July	52	24	33.8	2,080	B.
August	48	22	27.9	1,720	B.
September	1,050	22	61.9	3,680	B.
October	72	21	29.1	1,790	B.
November	2,050	24	308	18,300	C.
December	1,450	22	120	7,380	C.
The year	2,050	18	75.4	54,500	

HANALEI RIVER NEAR HANALEI, KAUAI.

Location.—About 5 miles up the river from Hanalei.
Records available.—December 28, 1911, to December 31, 1913.
Drainage area.—19.2 square miles.
Gage.—Staff.
Control.—Probably permanent.
Discharge measurements.—Cable and car or by wading.
Accuracy.—Records good for January, February, April, May, August, September, and October; for other months fair.

Discharge measurements of Hanalei River near Hanalei, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 25	Hardy and Horner	7.90	1,160	Nov. 12	W. V. Hardy	8.50	1,620
28	W. V. Hardy	6.75	214				

Daily discharge, in second-feet, of Hanalei River near Hanalei, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	124	124	93	93	93	93	124	93	158	124	93	124
2	158	124	93	93	158	93	1,180	93	248	93	248	124
3	158	124	93	124	93	825	364	93	158	93	158	825
4	124	124	93	124	93	124	364	93	124	93	124	124
5	124	158	93	93	124	124	364	93	124	93	93	124
6	124	200	93	93	124	124	124	124	124	93	93	124
7	124	124	124	93	200	124	124	124	158	248	200	124
8	124	124	124	124	124	124	124	124	124	200	158	124
9	124	124	93	124	124	158	124	124	124	124	158	93
10	158	124	93	124	124	124	124	93	93	93	500	93
11	124	124	93	124	124	124	124	93	93	93	364	93
12	158	124	93	93	200	124	124	124	124	93	955	93
13	302	93	93	158	124	158	248	158	124	124	200	93
14	158	93	93	124	124	124	200	158	124	124	158	93
15	158	93	93	124	124	124	158	124	93	124	124	93
16	124	93	93	93	124	364	124	248	93	93	124	93
17	124	124	93	93	124	124	124	158	93	93	124	93
18	124	291	93	93	124	124	158	124	93	124	158	93
19	124	158	124	93	124	93	124	93	124	93	248	93
20	158	124	124	93	124	93	93	93	93	93	910	93
21	124	124	124	93	124	124	93	124	93	93	200	93
22	124	124	124	93	124	124	93	124	93	93	158	93
23	124	93	124	93	124	124	124	93	93	93	158	93
24	124	124	910	93	124	124	124	124	93	93	158	93
25	124	124	910	124	96	124	124	124	68	124	200	93
26	124	93	655	93	93	124	93	115	68	124	200	93
27	124	93	124	124	93	364	158	124	68	124	124	93
28	124	93	224	124	93	124	124	364	158	124	93	93
29	124	.....	93	124	124	124	93	158	124	93	93	93
30	124	.....	124	158	124	124	93	248	124	93	158	93
31	124	.....	124	.....	93	.....	93	200	.....	124	.....	124

Monthly discharge of Hanalei River near Hanalei, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	302	124	137	8,420	A.
February	291	93	126	7,000	A.
March	910	93	178	10,900	B.
April	158	93	110	6,550	A.
May	200	93	122	7,500	A.
June	825	93	162	9,640	B.
July	1,180	93	184	11,300	B.
August	364	93	136	8,360	A.
September	248	68	116	6,900	A.
October	248	93	112	6,890	A.
November	955	93	224	13,300	B.
December	825	93	125	7,690	B.
The year	1,180	68	144	104,000	

KUNA DITCH NEAR HANALEI, KAUAI.

Location.—About 4 miles up the river from Hanalei and 500 feet below diversion from Hanalei River.

Records available.—January 17, 1912, to September 30, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made from footbridge.

Accuracy.—Records fair.

Discharge measurements of Kuna ditch near Hanalei, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 26	W. V. Hardy	4.88	23.8
Aug. 26	do	4.64	19.4

Daily discharge, in second-feet, of Kuna ditch near Hanalei, Kauai, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.0	4.5	22	22	22	27	34	22	25
2	5.7	4.5	22	22	24	26	48	22	29
3	5.7	4.5	22	24	22	29	38	22	25
4	5.7	4.5	22	24	22	28	38	22	24
5	5.0	5.7	22	22	22	28	38	23	24
6	5.0	7.4	22	22	22	28	35	23	24
7	5.0	4.5	24	22	24	27	35	23	25
8	4.5	4.5	24	24	22	27	35	23	24
9	4.5	4.5	22	24	22	28	35	23	24
10	5.0	4.5	22	24	22	28	34	22	23
11	4.5	4.5	22	24	22	28	34	22	24
12	5.0	4.5	22	22	24	27	34	23	24
13	6.5	22	22	26	22	28	35	24	24
14	5.0	22	22	24	22	28	34	24	13
15	5.0	22	22	24	22	28	32	23	13
16	5.0	22	22	22	22	31	32	27	13
17	5.0	24	22	22	22	28	34	23	13
18	5.0	24	22	22	22	28	36	24	13
19	5.0	24	24	22	22	28	35	23	13
20	5.7	24	24	22	22	28	31	22	13
21	5.0	24	24	22	22	28	31	23	13
22	5.0	24	24	22	22	30	31	23	13
23	5.0	22	24	22	22	30	32	22	13
24	5.0	24	42	22	22	30	32	23	11
25	5.0	24	30	22	21	30	34	24	11
26	5.0	22	26	22	21	30	32	21	11
27	5.0	22	24	22	28	38	32	24	13
28	5.0	22	22	22	29	32	26	29	14
29	5.0	.....	22	22	28	32	22	25	13
30	4.5	.....	24	24	28	32	22	27	13
31	4.5	.....	24	.....	28	.....	22	26	.....

Monthly discharge of Kuna ditch near Hanalei, Kauai, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	6.5	4.5	5.06	311	C.
February	24	4.5	15.2	844	C.
March	42	22	23.7	1,460	B.
April	26	22	22.7	1,350	B.
May	29	21	23.1	1,420	B.
June	38	26	29.0	1,730	B.
July	48	22	33.0	2,030	B.
August	29	22	23.5	1,440	B.
September	29	11	18.2	1,080	B.
The period				11,600	

WAINIHA RIVER (EAST AND WEST CHANNELS) AT POWER HOUSE, NEAR WAINIHA, KAUAI.

Location.—About 2 miles south of Wainiha and just northeast of Kauai Electric Co.'s power house.

Records available.—East Channel, February 25, 1912, to December 31, 1913; West Channel, December 30, 1911, to December 31, 1913.

Drainage area.—14.7 square miles.

Gage.—Two inclined timber gages—one on each channel—to obtain the total flow of the river at this point.

Control.—Two large channels, both rocky and probably permanent. The natives build fish dams at the point where the river divides above the stations, and this shifts the water from one channel to the other.

Discharge measurements.—Made from wire suspension footbridge over each channel, or by wading.

Accuracy.—East Channel, records fair; West Channel, records good.

Cooperation.—Stations maintained in cooperation with the Kauai Electric Co.

Discharge measurements of east channel of Wainiha River near Wainiha, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 31	W. V. Hardy	6.73	10.3	Nov. 13	W. V. Hardy	9.30	407
Apr. 24	D. E. Horner	6.72	12.7	Nov. 14	do	8.10	106
Aug. 23	W. V. Hardy	6.59	5.9				

Daily discharge, in second-feet, of east channel of Wainiha River near Wainiha, Kauai, for 1912–13.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.												
1	.....	.....	94	28	8	14	12	7	46	16	14	185
2	.....	.....	74	18	10	14	10	7	40	14	7	732
3	.....	.....	94	12	16	14	10	5	34	40	10	1,320
4	.....	.....	57	31	18	18	10	6	18	8	8	149
5	.....	.....	66	31	26	14	16	14	12	14	8	34
6	.....	.....	70	94	23	14	20	20	242	12	7	26
7	.....	.....	50	256	28	14	37	26	43	12	10	16
8	.....	.....	70	366	34	14	12	34	18	15	79	20
9	.....	.....	134	242	14	18	27	28	18	16	141	20
10	.....	.....	256	74	10	14	115	8	10	23	18	10
11	.....	.....	642	57	10	14	126	14	10	10	12	8
12	.....	.....	185	66	10	14	46	12	9	10	7	7
13	.....	.....	106	43	14	18	217	20	5	14	7	10
14	.....	.....	74	34	119	14	57	230	3	14	7	8
15	.....	.....	46	37	74	16	40	34	5	10	16	10
16	.....	.....	34	20	28	18	17	14	5	16	12	16
17	.....	.....	20	43	26	14	106	8	10	35	10	10
18	.....	.....	14	23	20	18	15	7	7	26	12	10
19	.....	.....	4	8	14	20	12	7	5	45	26	12
20	.....	.....	28	4	14	23	12	7	5	46	16	26
21	.....	.....	23	5	16	23	16	18	6	106	141	20
22	.....	.....	10	7	31	16	12	26	16	40	149	26
23	.....	.....	6	8	18	16	12	16	8	28	100	70
24	.....	.....	28	10	23	20	16	14	8	14	20	175
25	.....	10	349	12	16	14	10	9	6	16	12	134
26	.....	7	37	14	14	14	20	10	5	217	10	100
27	.....	14	23	8	23	14	12	79	5	34	8	18
28	.....	12	34	7	256	10	7	66	8	34	10	16
29	.....	16	18	8	89	10	8	66	10	18	119	10
30	.....	.....	16	5	28	10	12	119	10	23	141	10
31	.....	.....	16	.....	18	.....	10	94	.....	31	.....	10
1913.												
1	10	6	7	50	7	5	18	7	84	7	18	61
2	37	6	7	40	157	5	157	7	31	7	29	53
3	20	5	7	23	37	34	57	5	18	7	40	464
4	14	6	7	14	43	12	66	5	12	6	40	149
5	10	8	7	10	70	12	61	5	12	6	16	134
6	10	7	7	10	89	19	23	5	14	10	12	126
7	8	20	12	10	43	14	26	8	10	31	94	126
8	84	7	8	10	34	7	18	16	7	242	28	112
9	16	6	7	18	12	14	11	23	8	23	141	89
10	34	5	7	18	8	94	10	7	7	10	61	53
11	28	5	7	70	5	53	7	7	7	10	868	57
12	20	5	7	53	50	18	8	20	10	10	868	50
13	50	5	7	84	53	26	50	20	7	61	485	43
14	37	5	7	79	28	23	70	50	7	18	106	43
15	37	5	7	206	12	18	20	20	7	10	126	43
16	112	5	7	46	10	26	16	50	7	18	126	43
17	12	10	37	100	46	8	14	18	7	7	149	40
18	10	34	10	46	40	9	10	10	7	7	66	37
19	8	34	16	66	12	12	14	10	10	7	2,250	37
20	10	20	18	37	10	10	14	10	7	7	332	34
21	10	16	16	18	8	12	8	10	7	8	100	35
22	10	7	18	7	5	10	7	8	8	7	270	35
23	8	7	79	8	7	7	7	7	7	7	185	37
24	7	26	70	14	8	7	14	8	7	8	217	37
25	7	26	89	66	10	18	23	20	7	7	485	34
26	7	9	175	12	10	40	23	10	7	7	230	34
27	8	8	50	18	8	46	14	10	6	7	53	34
28	7	7	37	31	7	31	14	12	18	7	70	34
29	6	.....	34	53	6	14	26	66	7	7	620	34
30	6	.....	10	57	18	18	7	50	7	7	79	34
31	10	.....	10	.....	6	.....	8	23	.....	7	.....	34

Monthly discharge of east channel of Wainiha River near Wainiha, Kauai, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
February 25–29	16	7	11.8	117	
March	642	6	86.4	5,310	C.
April	366	4	52.4	3,120	C.
May	256	8	33.8	2,080	C.
June	23	10	15.5	922	C.
July	217	7	34.6	2,130	B.
August	230	5	33.1	2,040	B.
September	242	3	20.9	1,240	C.
October	217	8	30.9	1,900	A.
November	149	7	37.9	2,260	B.
December	1,320	7	104	6,400	B.
The period				27,500	
1913.					
January	112	6	21.1	1,300	A.
February	34	5	11.1	616	A.
March	175	7	25.4	1,560	A.
April	206	7	42.5	2,530	A.
May	157	5	27.7	1,700	A.
June	94	5	20.7	1,230	A.
July	157	7	26.5	1,630	A.
August	66	5	17.0	1,050	A.
September	84	6	12.0	714	B.
October	242	6	18.8	1,160	B.
November	2,250	12	272	16,200	C.
December	464	34	70.2	4,320	C.
The year	2,250	5	46.9	34,000	

Discharge measurements of west channel of Wainiha River near Wainiha, Kauai, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Aug. 23	W. V. Hardy	5.50	112	Nov. 13	W. V. Hardy	5.87	242
Nov 13	do	6.19	386				

Daily discharge, in second-feet, of west channel of Wainiha River near Wainiha, Kauai, for 1912–13.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.												
1	90	102	390	272	140	140	128	115	340	135	158	115
2	115	192	272	210	140	128	115	115	318	128	128	820
3	140	210	365	158	147	115	115	115	272	295	140	1,310
4	115	192	250	250	158	140	115	90	210	115	128	440
5	140	140	250	295	192	128	140	175	158	158	115	250
6	115	115	365	440	140	115	175	192	580	147	115	272
7	115	115	250	580	140	115	210	210	272	128	128	192
8	175	128	295	670	175	115	158	272	210	140	272	210
9	140	140	465	640	140	140	175	250	175	168	440	210
10	128	140	700	365	115	115	365	140	128	175	230	140
11	90	158	790	250	115	115	318	158	115	115	158	140
12	115	128	440	295	115	115	175	128	115	128	115	128
13	175	128	295	760	230	140	365	175	102	128	115	140
14	140	128	250	250	415	115	272	520	90	128	115	140
15	115	128	192	272	295	128	230	295	115	115	230	140
16	90	115	192	230	158	128	175	175	115	140	175	192
17	90	115	192	390	158	115	318	128	140	230	140	140
18	90	158	158	272	128	175	158	115	115	175	192	140
19	90	140	128	158	140	192	140	115	115	340	272	203
20	90	158	272	158	140	175	128	115	115	365	192	390
21	90	272	295	128	158	158	140	175	115	465	415	210
22	90	340	192	128	192	128	140	210	175	272	415	272
23	162	390	158	128	158	158	140	175	120	210	250	465
24	175	340	250	140	192	175	158	158	102	158	670	440
25	128	250	580	158	158	128	140	175	102	175	158	318
26	102	230	272	192	140	115	192	140	90	490	140	230
27	140	272	210	250	210	135	140	440	90	230	115	147
28	115	192	250	175	440	115	115	250	140	272	115	140
29	115	210	210	192	295	115	128	192	140	175	318	140
30	128	.....	210	158	140	115	128	490	115	175	390	140
31	140	.....	230	.....	140	.....	115	295	.....	230	.....	140
1913.												
1	140	115	115	272	128	115	158	115	365	115	160	140
2	295	115	115	230	318	115	415	115	230	115	205	140
3	210	115	115	210	210	230	295	115	175	115	250	520
4	175	115	115	175	115	140	318	115	140	102	250	295
5	140	140	115	140	192	140	295	102	140	102	158	272
6	140	128	115	120	365	182	210	102	175	140	128	250
7	128	175	140	115	230	175	210	128	140	230	295	250
8	415	140	128	115	210	115	175	175	115	580	230	230
9	192	115	115	192	140	175	140	192	128	250	415	175
10	340	115	115	175	115	318	128	115	115	140	318	140
11	295	115	115	295	102	272	115	115	115	140	730	140
12	295	115	115	272	272	175	128	175	140	140	730	115
13	465	102	115	520	230	192	295	192	115	295	670	115
14	272	102	115	490	140	210	340	272	115	175	230	115
15	340	115	115	490	115	175	192	192	115	140	250	115
16	210	115	115	340	128	210	158	295	115	175	250	115
17	158	140	230	465	175	115	140	175	115	115	272	115
18	140	295	135	230	230	115	128	140	115	115	230	115
19	135	295	158	192	158	140	140	120	140	115	580	115
20	140	230	175	158	115	115	140	128	115	115	440	110
21	140	192	158	158	128	128	128	140	115	128	210	115
22	140	140	175	135	115	115	115	128	128	115	415	105
23	128	140	580	102	128	115	115	115	115	115	440	105
24	115	272	640	128	140	115	140	128	115	128	440	102
25	115	192	730	365	128	175	192	192	115	115	550	90
26	115	135	390	140	128	250	192	140	110	115	365	90
27	128	128	272	175	128	250	158	140	102	115	210	90
28	115	115	230	210	115	210	140	158	175	110	175	95
29	115	.....	210	192	115	140	210	318	115	115	490	102
30	115	.....	175	250	175	158	115	272	115	115	175	102
31	158	.....	175	.....	115	.....	115	210	.....	115	.....	102

Monthly discharge of west channel of Wainiha River at power house, near Wainiha, Kauai, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
January	175	90	119	7,320	A.
February	390	102	184	10,600	A.
March	790	128	302	18,600	A.
April	760	128	285	17,000	A.
May	440	115	181	11,100	A.
June	192	115	133	7,910	A.
July	365	115	178	10,900	A.
August	520	90	203	12,500	A.
September	580	90	166	9,880	A.
October	490	115	203	12,500	A.
November	670	115	218	13,000	A.
December	1,310	115	269	16,500	A.
The year	1,310	90	204	148,000	
1913.					
January	465	115	194	11,900	A.
February	295	102	150	8,300	A.
March	730	115	204	12,500	A.
April	520	102	235	14,000	A.
May	365	102	165	10,100	A.
June	318	115	169	10,100	A.
July	365	115	185	11,400	A.
August	415	102	162	9,960	A.
September	365	102	138	8,210	A.
October	580	102	152	9,350	A.
November	730	128	342	20,400	A.
December	520	90	151	9,280	A.
The year	730	90	187	136,000	

MISCELLANEOUS MEASUREMENTS.

Measurements of streams on the island of Kauai at points other than regular gaging stations are listed below:

Miscellaneous discharge measurements on Kauai during the year ending Dec. 31, 1913.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.ft.*
Feb. 9	Mohihi	Waimea River	Elevation about 3,500 feet	3.81	3.04
Mar. 5	....do	....do	....do	3.77	2.47
July 6	....do	....do	....do	3.92	4.70
Feb. 9	Waiakoali	....do	....do	2.52	3.03
Mar. 5	....do	....do	....do	2.50	2.74
July 8	....do	....do	....do	2.84	10.1
July 9	....do	....do	....do	2.57	3.53
Apr. 30	Kamenehune ditch[a]		Near Waimea	.60	1.60
July 28	....do		....do	.37	.62
Oct. 14	Hanapepe River	Waimea River	Near Eleele	.38	29.0
June 21	Hanapepe ditch[b]		....do	1.21	15.5
Do	....do		....do	1.09	15.2
May 26	Kilauea River		Near Kilauea	7.70	4.69
Mar. 28	China ditch[c]		Near Hanalei	3.20	25.1
Apr. 26	....do		....do	3.35	26.5
May 25	....do		....do	3.64	30.5
Aug. 26	....do		....do	.....	19.8
Mar. 22	Lumahai River		Near Wainiha	.....	103
Mar. 30	....do		....do	.....	131
Sept. 17	....do		....do	.....	63.2
Oct. 21	....do		....do	.....	55.2

[a] Diverts from Waimea River. [b] Diverts from Hanapepe River. [c] Diverts from Hanalei River.

ISLAND OF OAHU.

KALIHI STREAM AT KIOI POOL, NEAR HONOLULU, OAHU.

Location.—At Kioi Pool, about three-eighths mile above Catholic Orphanage, 3 miles up Kalahi Road from King Street car line, and 5 miles north of Honolulu post office.

Records available.—September 8 to December 31, 1913.

Gage.—Gurley weight-driven register installed December 4. September 8 to November 22, 1913, Friez register. No record November 23 to December 3.

Control.—On November 20 a flood lowered the control 0.35 foot; after December 3, probably permanent.

Discharge measurements.—Made by wading or from suspension footbridge about 500 feet above station.

Discharge measurements of Kalihi Stream at Kioi Pool, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Sept. 8	G. R. White	2.64	2.37	Nov. 8	G. R. White	3.22	13.0
Sept. 27	do	2.58	1.71	Nov. 12	do	3.76	29.0
Oct. 4	do	2.58	1.29	Nov. 22	do	2.88	11.8
Oct. 12	do	2.54	1.06	Dec. 4	G. K. Larrison	5.08	96.0
Oct. 25	do	2.53	.98	Dec. 11	J. C. Dort	2.95	11.0
Nov. 8	do	3.41	18.8	Dec. 23	do	2.50	5.26

Daily discharge, in second-feet, of Kalihi Stream at Kioi Pool, near Honolulu, Oahu, for 1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	1.6	0.8	.....	16	2.2	1.7	4.4	6.9
2	.....	1.6	3.1	.....	17	1.9	1.4	4.4	7.3
3	.....	1.6	1.4	.....	18	2.6	1.3	5.0	6.6
4	.....	1.6	1.0	78	19	2.8	1.2	13	6.5
5	.....	1.7	1.0	46	20	2.2	1.1	28	6.3
6	2.9	1.9	1.0	76	21	2.2	1.1	18	6.0
7	2.6	2.4	8.6	64	22	4.4	1.1	9.8	5.7
8	2.5	3.8	18	28	23	2.1	1.1	.....	28
9	2.4	1.8	12	20	24	3.1	1.1	.....	5.1
10	2.5	1.7	8.4	16	25	2.2	1.0	.....	5.0
11	2.2	1.5	16	13	26	1.9	1.0	.....	4.9
12	1.9	1.3	18	10	27	1.6	1.0	.....	4.6
13	2.2	1.6	12	9.6	28	1.6	1.0	.....	4.5
14	3.1	2.1	6.8	10	29	1.6	.9	.....	4.4
15	2.4	1.8	5.2	9.6	30	1.6	.9	.....	4.2
					31	.....	.8	.....	4.2

NOTE.—Discharge estimated for days on which no gage heights were recorded, with the exception of period Nov. 23 to Dec. 3, 1913. Staff gage-height evidence indicated a maximum discharge of about 300 second-feet on night of Dec. 3.

NUUANU STREAM AT LUAKAHA WEIR IN UPPER NUUANU VALLEY, NEAR HONOLULU, OAHU.

Location.—About 1 mile above reservoir No. 4 (main) in upper Nuuanu Valley, and about 5 miles from Honolulu post office.

Records available.— ———, 1903, to December 31, 1913.

Gage.—Head is measured on iron pipe set about 3.0 feet back from weir crest; read once daily.

Control.—Permanent.

Discharge measurements.—Made by 4-foot sharp-crested weir with end contractions; check measurements made with current meter by wading. At times floods exceed the capacity of the diversion channel and are not measured. Waste water from this station is measured by station on the Nuuanu Stream below reservoir No. 4.

Diversions.—Aqueduct diverts seepage from reservoir No. 4, including inflow from Nuuanu Valley drainage below reservoir No. 4.

Cooperation.—Records furnished by waterworks department of city of Honolulu.

Monthly discharge of Nuuanu Stream at Luakaha weir, in Nuuanu Valley, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	11.8	2.76	4.62	284
February	4.71	2.41	2.60	144
March	9.18	1.47	3.07	189
April	9.53	2.41	3.69	220
May	15.0	2.41	4.96	305
June	15.2	3.63	4.77	284
July	5.14	2.88	3.79	233
August	4.85	2.64	2.94	181
September	4.16	1.47	2.24	133
October	2.19	.70	1.25	77
November	19.8	.56	5.60	333
December	20.2	6.04	9.56	588
The year	20.2	.56	4.10	2,970

NUUANU STREAM BELOW RESERVOIR NO. 2 WASTEWAY, NEAR HONOLULU, OAHU.

Location.—On Pali road in upper Nuuanu Valley, about 5 miles from Honolulu post office and 1 mile above end of car line.

Records available.—October 21 to December 31, 1913.

Gage.—Inclined staff read to hundredths.

Control.—Permanent.

Discharge measurements.—Low-water discharge measured by 2.0-foot sharp-crested weir with end contractions. Flood discharge measured by 12.0-foot sharp-crested weir with end contractions, which, with small weir, gives total flood discharge. Both weirs set in concrete structure. Small weir crest is 1.0-foot below large weir crest in elevation.

Diversions.—Irrigation ditch diverts low-water discharge at point 300 feet below gage. Station measures waste water and seepage from reservoirs Nos. 2, 3, and 4 and the Luakaha weir.

Daily discharge, in second-feet, of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, for 1913.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		0.21	14.9	16		3.34	11.4
2		.21	45.6	17		1.89	10.6
3		.21	55.4	18		1.83	10.6
4		.21	44.2	19		2.90	10.6
5		.21	30.4	20		27.1	10.6
6		.24	48.3	21	0.30	24.4	9.97
7		.27	36.5	22	.30	17.1	9.01
8		1.08	22.3	23	.30	10.3	7.85
9		1.95	18.9	24	.30	12.1	7.59
10		1.77	13.2	25	.27	29.3	7.35
11		5.05	12.1	26	.27	12.1	6.70
12		5.41	10.6	27	.24	49.4	6.51
13		6.34	9.64	28	.21	24.4	6.51
14		4.38	14.5	29	.21	17.1	6.13
15		3.12	12.5	30	.21	14.1	6.13
				31	.21		6.13

NOTE.—Mean for November, 9.27 second-feet; minimum for November, 0.21 second-feet. Mean for December, 16.9 second-feet; minimum for December, 6.13 second-feet.

LULUMAHA[1] DITCH AT UPPER NUUANU RESERVOIR, NEAR HONOLULU, OAHU.

Location.—About 500 feet east of spillway of upper Nuuanu Valley reservoir, about 7 miles northeast of Honolulu post office.

Records available.—September 2, 1911, to September 30, 1913.

Gage.—Vertical staff.

Control.—Shifting.

Discharge measurements.—Made by wading.

Diversions.—Low-water discharge is diverted from Lulumaha Stream into reservoir No. 4.

Accuracy.—Records poor.

Discharge measurements of Lulumaha ditch at upper Nuuanu reservoir, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 2	G. K. Larrison	0.31	0.58
14	J. C. Dort	.34	.77

[1] Incorrectly spelled "Lulumaho" in Water-Supply Paper 336.

Daily discharge, in second-feet, of Lulumaha ditch at upper Nuuanu reservoir, near Honolulu, Oahu, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.6	0.5	0.5	1.4	0.9	1.2	3.8	0.5	1.9
2	.5	.5	.5	.7	1.9	.9	3.8	.5	3.8
3	.5	.5	.5	1.2	1.9	6.5	1.9	.5	1.4
4	.5	.5	.5	.7	1.2	.9	1.4	.5	1.4
5	.3	.3	.5	.5	1.2	.9	1.4	.5	1.4
6	.3	2.5	.5	.5	.9	.9	1.4	.5	1.4
7	.3	1.4	.5	.5	5.4	.9	.9	.5	.9
8	.9	1.4	.5	.5	2.0	.9	.9	.5	.9
9	1.2	.9	.5	.5	3.1	1.4	1.2	.5	.9
10	2.9	.6	.5	.5	1.9	3.8	.9	.9	.9
11	8.0	.5	.5	.5	1.4	1.4	.9	.9	.9
12	1.7	.5	.5	2.9	1.4	1.2	.9	1.9	.9
13	1.6	.5	.5	5.8	4.9	1.2	.6	1.4	.9
14	1.0	.5	18.5	1.2	1.2	.9	.6	1.4	1.4
15	1.2	1.4	.9	3.8	2.5	.9	.6	1.9	.9
16	1.9	.9	.6	1.2	1.4	.9	.5	1.4	.6
17	1.4	6.2	.5	1.4	1.4	.9	.5	1.4	.5
18	1.2	1.4	.5	1.2	1.2	.9	.5	1.4	.5
19	1.0	.9	.5	.9	1.2	.9	.5	1.4	1.4
20	.8	.5	.5	.9	1.2	5.4	.5	1.4	.5
21	.8	.5	1.2	.9	1.2	1.2	.5	1.4	.5
22	.6	.5	1.2	.9	1.2	1.2	.5	1.4	.5
23	.6	.5	5.1	1.1	.9	1.2	.5	1.4	.5
24	.6	2.5	1.6	.9	.9	.9	.5	1.4	.5
25	.5	.5	1.0	2.0	.9	.9	.9	1.4	.5
26	.5	.5	1.0	1.4	.9	.9	.9	1.4	.5
27	.5	.5	.9	1.2	1.2	1.2	.6	1.9	.5
28	.5	.5	.5	1.4	1.2	1.4	.6	6.5	.5
29	.5	.....	.5	1.2	1.4	1.4	.9	1.4	.5
30	.5	.....	.5	.9	1.2	3.8	.5	1.4	.5
31	.5	.....	3.8	.....	1.2	.....	.5	1.4	.....

Monthly discharge of Lulumaha ditch at upper Nuuanu reservoir, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	8.0	0.3	1.09	67.0	D.
February	6.2	.3	1.01	56.1	D.
March	18.5	.5	1.48	91.0	D.
April	5.8	.5	1.10	65.5	D.
May	5.4	.9	1.63	100	D.
June	6.5	.9	1.57	93.4	D.
July	3.8	.5	.99	60.9	D.
August	6.5	.5	1.32	81.2	D.
September	3.8	.5	.95	56.5	D.
The period	.....	.....	.....	672	

PAUOA STREAM AT UPPER PAUOA VALLEY, NEAR HONOLULU, OAHU.

Location.—In upper Pauoa Valley, 1,000 feet below Kahuawai Spring, about 1 mile above Punchbowl, and about 2.5 miles northeast of Honolulu post office.

Records available.—April 14, 1911, to December 31, 1913.

Gage.—Watson weekly water-stage recorder October 17, 1911, to December 31, 1913; staff gage, graduated to tenths and read to hundredths, April 14 to October 16, 1911.

Control.—Permanent.

Discharge measurements.—April 14 to October 16, 1911, current-meter measurements made by wading; October 17, 1911, to December 31, 1913, by 4-foot sharp-crested weir that has been checked with current-meter measurements.

Diversions.—Several small ditches and one pipe line divert part of low-water discharge.

Regulation.—Stream is fed by several perennial springs within 2 miles above station.

Discharge measurements of Pauoa Stream at upper Pauoa Valley, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 4	G. K. Larrison	0.16	0.91
Sept. 11	G. R. White	.15	.54
Oct. 2	J. C. Dort	.11	.48

Daily discharge, in second-feet, of Pauoa Stream at upper Pauoa Valley, near Honolulu, Oahu, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.19	1.47	0.93	2.41	8.31	1.77	4.16	0.70	0.89	0.55	0.55	2.88
2	2.19	1.37	1.02	1.77	3.50	1.77	6.56	.70	.90	.55	.55	2.76
3	2.08	1.37	.93	1.97	2.41	1.66	3.50	.62	.91	.55	.55	12.5
4	1.97	1.28	.85	2.08	5.29	5.14	2.41	.85	.92	.55	.55	8.14
5	1.97	1.28	.85	1.10	7.64	5.58	3.12	1.02	.93	.55	.55	6.66
6	1.97	1.28	.85	1.10	4.57	2.64	1.97	1.02	.93	.55	.94	6.98
7	1.87	1.37	.77	1.02	3.00	2.53	1.57	1.02	.85	.55	1.32	6.19
8	1.87	1.37	.77	1.02	3.24	2.30	1.57	1.02	.85	.55	1.70	5.29
9	4.85	1.37	.77	.93	3.63	2.08	1.77	.93	.77	.55	2.09	5.29
10	3.37	1.37	.77	.85	3.00	3.24	1.57	.93	.77	.55	2.48	5.14
11	5.43	1.37	.70	.85	2.53	4.16	1.57	.85	.77	.55	2.86	4.57
12	2.53	1.37	.62	3.24	2.19	3.37	1.47	.93	.77	.62	3.24	4.29
13	4.43	1.37	.62	14.1	2.08	2.41	1.47	.93	.77	.70	3.63	4.29
14	3.50	1.37	2.30	3.50	2.30	2.19	1.37	.93	.85	.62	2.08	4.29
15	3.00	1.28	1.02	2.41	2.19	1.97	1.37	.85	.85	.55	1.47	4.29
16	2.64	1.19	.85	1.77	7.47	1.97	1.37	.85	.77	.55	1.19	4.16
17	2.30	1.10	.93	3.89	5.43	1.77	1.37	.77	.77	.55	1.02	4.16
18	2.08	1.10	.85	3.76	2.76	1.77	1.37	.77	.85	.55	2.08	3.76
19	1.97	1.10	.77	2.76	2.19	1.77	1.37	.77	1.10	.55	3.24	3.76
20	1.87	1.10	.77	2.19	1.97	4.16	1.37	.77	.77	.55	6.82	3.76
21	1.77	1.02	.93	1.66	2.08	2.19	1.37	.77	.77	.55	3.76	3.63
22	1.77	1.02	1.19	1.47	2.19	1.77	1.19	.85	.70	.55	1.97	3.63
23	1.66	1.02	1.10	2.19	2.08	1.57	1.37	.85	.70	.55	1.66	3.54
24	1.66	.93	1.02	3.63	1.87	1.57	1.77	.77	.70	.55	3.76	3.46
25	1.66	1.02	.93	8.48	1.77	1.47	1.37	.77	.70	.55	16.2	3.37
26	1.66	1.02	.85	2.41	1.97	1.47	1.19	.85	.62	.55	12.9	3.24
27	1.57	1.02	.93	1.87	1.97	1.47	1.02	.85	.62	.55	5.58	3.00
28	1.57	1.02	.93	3.63	1.97	3.37	1.37	.85	.55	.55	3.37	2.88
29	1.57	.....	1.02	4.29	1.97	1.97	1.28	.86	.62	.55	2.76	2.88
30	1.57	.....	.93	2.19	1.97	2.64	1.28	.87	.62	.55	3.24	2.76
31	1.47	.....	3.63	.....	1.87	.....	.70	.88	.....	.55	.....	2.64

Monthly discharge of Pauoa Stream at upper Pauoa Valley, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	5.43	1.47	2.32	143	A.
February	1.47	.03	1.21	67.2	A.
March	3.63	.62	1.01	62	A.
April	14.1	.85	2.82	168	A.
May	8.31	1.77	3.14	193	A.
June	5.58	1.47	2.44	146	A.
July	6.56	.7	1.81	111	A.
August	1.02	.62	.85	52.3	A.
September	1.1	.55	.79	47	A.
October	.7	.55	.56	34.4	D.
November	16.2	.55	3.14	187	C.
December	12.5	2.64	4.46	274	A.
The year	16.2	.55	2.05	1,480	

KAHUAWAI SPRING AT UPPER PAUOA VALLEY, NEAR HONOLULU, OAHU.

Location.—In upper Pauoa Valley, one-fourth mile above Pauoa Stream weir station, about 1¼ miles above Punchbowl, and about 2¾ miles northeast of Honolulu post office.

Records available.—September 23, 1912, to December 31, 1913.

Gage.—A 2 by 2 inch stake driven into pool of spring, with nail in top, 6 feet above weir, to measure head on weir. Head is read twice daily to hundredths.

Control.—Spring boils up vertically in pool about 10 feet in diameter. Weir is built between rock abutments on south side of pool about 10 feet from center.

Discharge.—Computed by Francis formula for sharp-crested weirs with end contractions. Weir has 1.5-foot crest length.

Monthly discharge of Kahuawai Spring at upper Pauoa Valley, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	0.54	0.50	0.50	30.7	A.
February	.50	.47	.50	27.8	A.
March	.50	.47	.48	29.5	A.
April	.50	.50	.50	29.8	A.
May	.54	.50	.51	31.4	A.
June	.54	.50	.52	30.9	A.
July	.54	.50	.50	30.7	A.
August	.50	.50	.50	30.7	A.
September	.50	.50	.50	29.8	A.
October	.50	.50	.50	30.7	A.
November	.54	.50	.53	31.5	A.
December	.54	.54	.54	33.2	A.
The year	.54	.47	.51	367	

MANOA STREAM AT UPPER MANOA VALLEY, NEAR HONOLULU, OAHU.

Location.—Below confluence of two main branches in upper Manoa Valley, about 5 miles east of Honolulu post office.

Records available.—October 6, 1910, to July 5, 1913.

Gage.—Vertical staff.

Control.—Shifting.

Discharge measurements.—Made by wading for low and medium stages up to a gage height of about 4.0 feet; above this stage from footbridge at gage.

Diversions.—Several small irrigation ditches divert a part of the low-water discharge from the branches of the stream above the station. Most of this water returns to the stream by seepage and drains above the station.

Accuracy.—Records poor.

Discharge measurements of Manoa Stream at upper Manoa Valley, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 28	G. K. Larrison	2.93	1.08	Apr. 14	J. C. Dort	3.70	18.5
Mar. 21	J. C. Dort	3.36	6.06				

Monthly discharge of Manoa Stream at upper Manoa Valley, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	5.1	1.2	2.43	149	D.
February	12.2	1.1	2.70	150	D.
March	15	1.1	3.40	209	D.
April	33	2.5	11.5	684	D.
May	39	7.9	13.6	836	D.
June	38	7.2	12.2	726	D.
July 1–5	13	10	11.6	115	D.
The period				2,870	

NOTE.—Two stations were established on the east and west branches of Manoa Stream May 29, 1913. These stations are above all diversions and are intended to supplant the old station, which was discontinued July 5, 1913.

MANOA STREAM AT COLLEGE OF HAWAII, NEAR HONOLULU, OAHU.

Location.—In gorge about one-half mile southeast of College of Hawaii, and 3 miles east of Honolulu post office.

Records available.—Daily discharge from March 23, 1909, to November 24, 1910; November 1, 1912, to April 26, 1913; September 10 to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversions.—Several irrigation ditches above station.

Accuracy.—Records poor.

Cooperation.—Maintained in cooperation with the College of Hawaii.

Discharge measurements of Manoa Stream at College of Hawaii, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 28	G. K. Larrison	0.95	0.99	Apr. 14	J. C. Dort	2.40	39.4
Mar. 21	J. C. Dort	2.09	26.0	17	Dort and White	2.64	56.7

Daily discharge, in second-feet, of Manoa Stream at College of Hawaii, near Honolulu, Oahu, for 1912–13.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1912.			1912.			1912.		
1	2.6	35	11	4.8	4.0	21	33	20
2	2.0	38	12	5.5	2.0	22	35	106
3	3.0	169	13	2.0	3.5	23	38	33
4	1.1	29	14	1.2	3.5	24	18	155
5	3.9	22	15	6.2	2.0	25	11	20
6	2.0	19	16	2.5	1.8	26	7.0	45
7	7.0	17	17	2.0	1.5	27	7.0	29
7	3.0	11	18	2.2	1.8	28	62	20
9	29	7.0	19	2.3	31	29	33	7.0
10	3.8	7.0	20	2.0	6.7	30	14	7.0
						31		7.0

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	7.0	0.9	1.0	5.8						0.5	0.6	11
2	7.0	1.2	.9	6.4						.5	1.5	8.0
3	3.2	1.4	.9	4.3						.5	2.5	44
4	2.0	1.3	1.2	3.1						.5	1.0	102
5	2.0	1.0	1.4	2.4						.5	.8	41
6	2.0	1.9	1.2	1.9						.5	.9	44
7	2.0	6.7	1.2	1.9						.5	1.0	65
8	2.0	6.1	1.1	2.6						.5	15	28
9	4.0	2.6	1.2	2.5						.5	31	18
10	7.0	1.8	1.3	20					0.6	.5	32	12
11	10	1.6	1.2	13					.5	.5	36	9.4
12	6.0	1.2	1.2	21					.5	.4	31	7.8
13	14	1.0	1.2	57					.6	.4	27	7.0
14	18	.9	6.4	37					1.2	.7	12	8.0
15	12	.9	8.0	48					1.0	.6	9.4	6.4
16	6.4	.9	6.4	64					.7	.6	3.8	4.8
17	4.6	1.0	3.4	33					.7	.6	4.6	4.6
18	3.6	9.0	2.6	24					.7	.5	6.7	5.8
19	3.4	11	1.8	24					4.9	.5	23	3.9
20	2.8	3.2	4.4	19					1.1	.5	61	3.1
21	6.1	1.2	3.6	13					.8	.5	31	3.1
22	4.8	1.0	10	9.8					.8	.5	9.8	2.8
23	4.9	1.8	4.6	18					.8	.5	9.4	1.9
24	4.3	2.7	3.4	8.4					.7	.5	32	1.4
25	3.0	3.2	3.1	67					.7	.5	75	1.0
26	2.6	2.4	3.3	18					.6	.5	141	.9
27	2.0	1.6	2.2						.6	.5	50	.9
28	2.0	1.0	2.8						.5	.6	27	.9
29	1.9		3.7						.5	.6	18	.8
30	.9		15						.5	.6	17	.8
31	2.0		11							.6		.7

NOTE.—No record Apr. 27 to Sept. 9, 1913.

Monthly discharge of Manoa Stream at College of Hawaii, near Honolulu, Oahu, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
November	62	1.1	11.5	684	C.
December	169	1.5	27.8	1,710	D.
1913.					
January	18	0.9	4.95	304	C.
February	11	.9	2.52	140	C.
March	15	.9	3.57	220	C.
April 1–26	67	1.9	2.02	1,040	B.
September 10–30	4.9	.5	.90	38	
October	.7	.4	.52	32	D.
November	141	.6	23.7	1,410	C.
December	102	.7	14.5	892	C.
The period				4,080	

EAST BRANCH OF MANOA STREAM AT UPPER MANOA VALLEY, NEAR HONOLULU, OAHU.

Location.—About 4 miles northeast of Honolulu post office, in upper Manoa Valley, about 200 feet above highway bridge, and 600 feet above confluence of two branches.

Records available.—May 29 to December 31, 1913.

Gage.—Vertical staff.

Control.—Somewhat shifting at high water.

Diversions.—One irrigation ditch diverts water above station.

Discharge measurements.—For low and medium stages, made by wading just below highway bridge; for floods, from bridge.

Accuracy.—Records good.

Discharge measurements of East Branch of Manoa Stream at upper Manoa Valley, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 23	G. K. Larrison	2.19	2.41	Nov. 12	J. C. Dort	2.84	10.2
Sept. 11	do	2.07	1.63	Dec. 4	G. R. White	3.38	24.0
Nov. 10	J. C. Dort	2.54	4.91				

Daily discharge, in second-feet, of East Branch of Manoa Stream at upper Manoa Valley, near Honolulu, Oahu, for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.9	2.1	1.8	1.7	1.6	1.5	3.0
2	.....	1.9	2.1	1.8	2.0	1.5	1.8	4.5
3	.....	19	2.1	1.7	1.8	1.5	1.6	20
4	.....	3.2	2.1	1.7	1.7	1.5	1.5	23
5	.....	2.6	2.1	1.7	1.7	1.6	1.6	14
6	.....	2.7	2.0	1.8	5.4	1.6	1.6	14
7	.....	2.6	2.0	1.8	1.7	1.7	15	18
8	.....	2.6	2.0	1.7	1.7	2.1	7.8	5.2
9	.....	3.3	2.0	1.7	1.6	1.6	7.4	7.4
10	.....	3.7	2.0	2.2	1.6	1.6	3.8	5.8
11	.....	3.0	2.0	1.8	1.6	1.5	4.3	5.7
12	.....	2.3	2.0	5.6	1.7	1.5	7.4	5.3
13	.....	2.1	2.2	2.0	1.9	1.9	6.6	5.2
14	.....	2.0	2.3	1.9	1.7	1.8	4.5	4.8
15	.....	2.0	2.0	1.8	1.6	1.6	3.2	4.6
16	.....	2.0	1.9	1.8	1.6	2.0	2.4	4.2
17	.....	2.0	1.9	2.2	1.5	1.6	2.4	3.8
18	.....	2.0	1.9	1.9	1.7	1.5	4.8	3.6
19	.....	2.3	1.8	1.8	2.1	1.5	8.3	3.0
20	.....	88	1.8	1.8	1.6	1.5	45	3.4
21	.....	2.2	1.8	1.9	1.8	1.5	8.8	3.3
22	.....	2.1	1.8	1.9	1.7	1.5	5.6	3.0
23	.....	2.0	1.8	2.0	1.6	1.5	4.4	2.8
24	.....	2.0	1.8	2.0	1.6	1.5	4.3	2.8
25	.....	2.1	1.9	2.0	1.6	1.5	14	2.8
26	.....	2.1	2.0	2.0	1.5	1.5	17	2.8
27	.....	2.1	1.8	1.9	1.5	1.6	15	2.8
28	.....	2.0	2.0	2.2	1.7	1.6	8.3	2.8
29	2.2	2.0	1.8	2.0	1.6	1.5	6.1	2.8
30	2.0	2.1	1.8	2.0	1.6	1.6	5.8	2.8
31	1.9	.....	1.8	3.6	.....	1.5	.....	2.8

NOTE.—Discharge July 1-10 estimated by comparison with other stream run-off in vicinity.

Monthly discharge of East Branch of Manoa Stream at upper Manoa Valley, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 29-31	2.2	1.9	2.03	12.1	B.
June	88	1.9	5.72	340	B.
July	2.3	1.8	1.95	120	B.
August	5.6	1.7	2.06	127	B.
September	5.4	1.5	1.80	107	B.
October	2.1	1.5	1.60	98.4	B.
November	45	1.5	7.39	440	B.
December	23	2.8	6.13	377	B.
The period	.....	.....	.....	1,620	

WEST BRANCH OF MANOA STREAM AT UPPER MANOA VALLEY, NEAR HONOLULU, OAHU.

Location.—About 150 feet above highway bridge in upper Manoa Valley, and 4 miles northeast of Honolulu post office.

Records available.—May 29 to December 31, 1913.

Gage.—Vertical staff.

Control.—Somewhat shifting.

Discharge measurements.—At low and medium stages made by wading; flood measurements made from footbridge.

Diversions.—None above station.

Accuracy.—Records good.

Discharge measurements of West Branch of Manoa Stream at upper Manoa Valley, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 23	G. K. Larrison	1.84	2.44	Nov. 10	J. C. Dort	2.62	10.1
Sept. 11	do	1.53	.68	Nov. 12	do	2.95	19.2

Daily discharge, in second-feet, of West Branch of Manoa Stream, at upper Manoa Valley, near Honolulu, Oahu, for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.4	1.9	1.3	4.0	0.6	0.4	4.7
2		1.2	2.0	1.4	2.6	.2	.8	4.5
3		14	2.0	1.5	1.4	.5	1.0	14
4		3.4	2.1	1.4	1.2	.5	.7	18
5		2.4	2.1	1.8	1.3	.6	.6	10
6		2.6	2.2	1.3	1.0	.6	.6	11
7		1.8	2.2	1.5	.8	.7	6.0	8.2
8		1.3	2.3	1.1	.7	3.5	8.2	6.8
9		4.4	2.3	1.2	.6	.8	13	4.6
10		5.4	2.4	3.5	.6	.6	9.2	4.6
11		4.0	2.5	1.3	.6	.5	12	4.3
12		3.1	2.4	8.0	.7	.5	15	8.6
13		6.4	2.3	2.0	1.6	.8	10	4.1
14		16	1.8	1.6	1.6	.4	5.8	3.5
15		16	2.0	1.2	.8	.7	4.7	1.3
16		2.3	1.9	1.2	.7	2.2	4.1	.1
17		2.1	1.3	2.5	.6	.6	4.3	1.4
18		2.2	1.6	1.4	1.1	.5	5.4	.1
19		3.5	1.4	1.1	3.4	.5	10	.8
20		68	1.6	1.2	1.6	.5	22	3.8
21		3.4	1.7	1.0	1.2	.4	9.7	4.0
22		2.6	1.4	.9	.9	.4	6.4	1.8
23		2.1	1.8	.9	.9	.4	4.3	3.0
24		1.9	2.7	.9	.9	.4	9.4	2.6
25		1.9	1.7	.9	.8	.4	8.5	2.5
26		1.9	1.5	.7	.7	.4	23	2.4
27		1.9	2.0	.7	.6	.7	17.0	2.3
28		2.6	1.7	1.2	.5	1.4	9.2	2.1
29	1.6	1.7	2.0	1.7	.8	.6	7.3	2.0
30	1.6	1.8	1.9	1.1	.6	.4	5.6	2.0
31	4.6		1.8	3.5		.4		1.9

NOTE.—Discharge estimated July 1–10.

Monthly discharge of West Branch of Manoa Stream at upper Manoa Valley, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 29–31	4.6	1.6	2.60	15.5	B.
June	68	1.2	6.11	364	B.
July	2.7	1.3	1.95	120	B.
August	8.0	.7	1.65	101	B.
September	4.0	.5	1.16	69	B.
October	3.5	.2	.70	43	B.
November	23	.4	7.81	465	B.
December	18	.1	4.55	280	B.
The period				1,460	

WAIOMAO STREAM AT UPPER PALOLO VALLEY, NEAR HONOLULU, OAHU.

Location.—About 3 miles above Pukele in Palolo Valley, and about 9 miles from Honolulu post office, at an elevation of 900 feet.

Records available.—October 10, 1911, to July 12, 1913.

Gage.—Watson water-stage recorder above 3-foot sharp-crested weir; datum uncertain on account of leaks under weir.

Control.—Shifting.

Discharge measurements.—Made by wading.

Diversions.—New pipe line diverted all low-water discharge for Honolulu water supply after July 12, 1913.

Accuracy.—Records fair.

Regulation.—Stream drains Kaau Crater and is regulated by springs.

Discharge measurements of Waiomao Stream at upper Palolo Valley, near Honolulu, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 26	G. K. Larrison	0.12	0.49
Apr. 8	....do	.08	.29

Daily discharge, in second-feet, of Waiomao Stream at upper Palolo Valley, near Honolulu, Oahu, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	0.37	0.19	0.37	0.96	0.58	0.32	1.24
2	.27	.19	.37	.70	1.10	.37	1.56
3	.27	.19	.37	.70	1.17	4.30	1.17
4	.27	.42	.32	.58	.82	3.02	.89
5	.52	4.08	.32	.47	.64	1.56	.89
6	.32	1.64	.32	.37	.47	1.32	.64
7	.27	1.48	.52	.32	1.10	.89	.70
8	.23	1.72	.47	.32	3.64	.76	.52
9	.27	.82	.37	.32	1.64	.70	.52
10	.37	.58	.32	.32	1.24	.64	.42
11	.89	.47	.32	.76	1.03	.52	.42
12	.58	.37	.27	1.24	4.88	.82	.52
13	.70	.32	.27	4.08	3.75	1.03	.....
14	.58	.27	3.32	2.52	2.34	.76	.....
15	.64	1.89	2.07	1.80	2.16	1.64	.....
16	.70	2.52	1.17	3.22	1.72	2.82	.....
17	.42	2.16	.89	3.22	1.56	2.16	.....
18	.47	3.02	.64	1.89	1.17	1.24	.....
19	.47	2.25	.52	1.40	1.03	1.03	.....
20	.42	1.32	.47	1.10	.76	1.64	.....
21	.37	.89	1.64	.82	.64	1.03	.....
22	.37	.70	1.89	.82	.58	.76	.....
23	.32	.64	1.32	1.10	.53	.64	.....
24	.27	.89	1.98	1.03	.48	.52	.....
25	.23	.64	1.72	5.48	.42	.47	.....
26	.19	.58	1.17	1.80	.37	.47	.....
27	.23	.52	1.10	1.10	.52	1.64	.....
28	.19	.42	.76	.96	.37	3.12	.....
29	.19	.....	.64	.82	.37	1.48	.....
30	.19	.....	1.10	.64	.37	1.48	.....
31	.27	.....	.89	.....	.32	.....	.....

NOTE.—Discharge May 22–24 estimated.

Monthly discharge of Waiomao Stream at upper Palolo Valley, near Honolulu, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	0.89	0.19	0.38	23.4	C.
February	4.08	.19	1.11	61.6	C.
March	3.32	.27	.90	55.3	C.
April	5.48	.32	1.36	80.9	C.
May	4.88	.32	1.22	75.0	C.
June	4.30	.32	1.30	77.4	C.
July 1–12	1.56	.42	.79	18.8	C.
The period	.....	.....	.....	390	

WAIMANALO DITCH BELOW MAIN RESERVOIR ON THE WAIMANALO PLANTATION, NEAR WAIMANALO, OAHU.

Location.—On main ditch immediately below main reservoir of the Waimanalo plantation, about 2 miles southwest of the plantation headquarters. Waimanalo is about 15 miles east of Honolulu.

Records available.—November 1, 1912, to December 31, 1913.

Gage.—Vertical staff, read twice daily to quarter-tenths.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversions.—Ditch is outlet of the main reservoir on the Waimanalo plantation.

Accuracy.—Records good.

Cooperation.—Maintained in cooperation with the Waimanalo Plantation Co.

Discharge measurements of Waimanalo ditch below main reservoir on the Waimanalo plantation, near Waimanalo, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 11	G. K. Larrison	1.18	6.15
Sept. 9	G. R. White	1.42	7.53

Daily discharge, in second-feet, of Waimanalo ditch below main reservoir on the Waimanalo plantation, near Waimanalo, Oahu, for 1912–13.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1912.			1912.			1912.		
1	6.9	7.4	11	7.5	.....	21	7.1	.....
2	6.7	7.4	12	7.3	.....	22	7.3	.....
3	6.9	7.4	13	7.0	.....	23	6.9	.....
4	7.1	7.4	14	7.0	.....	24	7.1	.....
5	7.2	7.4	15	7.3	.....	25	7.3	.....
6	6.9	7.4	16	6.9	.....	26	7.0	.....
7	6.9	7.4	17	7.1	.....	27	7.3	.....
8	6.6	7.4	18	7.3	.....	28	6.9	.....
9	7.2	7.4	19	7.3	.....	29	7.4	.....
10	7.4	.....	20	6.9	.....	30	7.4	.....
						31	.....	.....

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	7.0	.....	.....	6.2	6.8	6.7	7.4	7.3	7.3	6.8	6.8	7.4
2	6.7	.....	.....	6.2	7.4	7.3	6.9	6.9	7.3	6.8	7.1	7.4
3	6.9	.....	6.8	6.2	7.4	.....	6.9	7.2	6.8	6.8	7.4	7.4
4	7.1	.....	6.8	6.2	5.1	.....	7.1	7.4	6.8	6.8	7.4	7.4
5	.....	.....	6.8	6.2	7.3	.....	6.9	7.4	6.8	7.1	6.8	.....
6	.....	.....	6.8	6.2	7.3	.....	7.2	6.9	6.8	7.4	6.8	.....
7	.....	.....	6.8	6.2	7.3	.....	7.5	6.8	7.0	7.1	6.8	.....
8	.....	.....	6.7	6.2	7.4	.....	7.4	6.8	7.3	6.8	6.8	.....
9	.....	.....	6.8	6.2	7.3	7.3	7.8	6.8	7.3	6.8	7.1	.....
10	.....	.....	6.8	6.2	7.3	7.3	7.5	7.1	6.8	6.8	7.4	.....
11	.....	.....	6.8	6.2	6.7	.....	7.5	7.4	6.8	6.8	7.1	.....
12	.....	.....	6.8	6.2	.....	.....	7.3	7.4	6.8	7.1	6.8	.....
13	.....	.....	6.8	6.2	.....	.....	7.6	7.4	6.8	7.4	6.8	.....
14	.....	.....	6.8	6.2	.....	.....	7.8	7.4	7.0	7.1	6.8	.....
15	.....	.....	.....	6.2	.....	.....	7.5	7.4	7.3	6.8	6.8	.....
16	.....	.....	5.6	6.2	.....	6.8	7.5	6.8	7.3	6.8	7.1	.....
17	.....	.....	5.6	6.2	.....	6.8	7.4	7.1	6.8	6.8	7.4	.....
18	.....	.....	6.8	6.2	.....	6.2	7.4	7.4	6.8	6.8	7.4	.....
19	.....	.....	6.8	6.2	.....	6.2	7.3	7.1	6.8	7.1	7.1	.....
20	.....	.....	6.8	6.2	6.2	6.2	7.4	7.1	6.8	7.4	6.8	.....
21	.....	.....	6.8	6.3	6.2	6.5	7.5	7.1	7.0	7.1	6.8	.....
22	.....	.....	6.8	6.3	6.7	6.1	7.5	7.1	7.3	6.8	6.8	.....
23	.....	.....	6.8	6.3	6.9	6.9	7.4	6.8	7.3	6.8	7.1	.....
24	.....	.....	6.8	6.3	7.4	6.9	7.3	7.1	6.8	6.8	7.4	.....
25	.....	.....	6.5	6.5	6.3	6.7	7.3	7.4	6.8	6.8	7.4	.....
26	.....	.....	6.2	6.5	7.3	6.9	6.9	7.4	6.8	7.1	7.4	.....
27	.....	.....	6.2	5.6	7.4	7.1	6.9	7.1	6.8	7.4	7.4	.....
28	.....	.....	6.2	6.8	6.9	7.1	6.9	7.1	7.0	7.4	7.4	.....
29	.....	.....	6.2	6.2	6.9	6.2	6.9	6.9	7.3	6.8	7.4	.....
30	.....	.....	6.2	7.4	7.4	7.3	6.9	6.8	7.1	6.8	.....	.....
31	.....	.....	6.2	.....	7.3	.....	6.9	7.0	.....	6.8	.....	.....

NOTE.—Ditch dry Dec. 10–31, 1912; Jan. 5 to Mar. 2, May 12–19, June 3–8, 11–15, and Dec. 6–31, 1913. Discharge given is for period of about 10 hours daily. During remaining 14 hours ditch was dry. Discharge interpolated Sundays from July to December, as gage was not read.

Monthly discharge of Waimanalo ditch below main reservoir on the Waimanalo plantation, near Waimanalo, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 1–4	7.1	6.7	6.92	22.9	B.
February					
March 3–14, 16–31	6.8	5.6	6.57	152	B.
April	7.4	5.6	6.27	155	B.
May 1–11, 20–31	7.4	5.1	6.97	132	B.
June 1, 2, 9, 10, 16–30	7.3	6.1	6.76	106	B.
July	7.8	6.9	7.28	187	B.
August	7.4	6.8	7.13	183	B.
September	7.3	6.8	6.99	173	B.
October	7.4	6.8	6.96	178	B.
November	7.4	6.8	7.09	408	B.
December 1–4	7.4	7.4	7.40	58.7	B.
The period				1,760	

NOTE.—Ditch dry during February. Water turned out of ditch Dec. 4.

MAKAWAO DITCH AT MAKAWAO FLUME, NEAR WAIMANALO, OAHU.

Location.—At west end of flume in Kailua Valley, 4 miles west of Waimanalo, and 11 miles by road from Honolulu; previous to November 24, 1913, at east end of flume.

Records available.—November 1, 1912, to December 31, 1913.

Gage.—Staff; new datum beginning November 24, 1913.

Control.—Practically permanent.

Discharge measurements.—November 1, 1912, to November 23, 1913, made by current-meter in open flume; November 24 to December 31, 1913, by 2.5-foot sharp-crested weir with end contractions.

Diversions.—Ditch diverts all low water from headwaters of Kaimi and Makawao streams and discharges into the Waimanalo Reservoir.

Accuracy.—Records poor.

Cooperation.—Observer furnished by Waimanalo Plantation Co.

Discharge measurements of Makawao ditch at Makawao flume, near Waimanalo, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	G. K. Larrison	0.59	3.03	Oct. 20	J. C. Dort	0.65	1.79
Sept. 9	G. R. White	.70	1.96				

Monthly discharge of Makawao ditch at Makawao flume, near Waimanalo, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 3–31	5.4	2.0	3.75	216	D.
April	7.3	3.0	4.08	243	D.
May	7.9	2.6	3.88	239	D.
June	4.4	2.3	3.16	188	D.
July	3.2	1.9	2.43	149	D.
August	3.2	2.1	2.57	158	D.
September	2.7	1.6	1.97	117	D.
October	2.1	1.6	1.95	120	D.
November	6.0	1.9	3.29	196	D.
December 1–3	3.6	1.9	2.97	17.1	D.
The period (276 days)	7.9	1.6	3.00	1,640	

NOTE.—Ditch dry Jan. 1 to Mar. 2 and Dec. 4–31.

MAKAWAO STREAM IN KAILUA VALLEY, NEAR KAILUA, OAHU.

Location.—One-fourth mile upstream from confluence of Makawao and Kaimi streams, and 100 feet above intake of irrigation ditch on Waimanalo-Honolulu road; about 12½ miles east by road from Honolulu.

Records available.—November 12, 1912, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading and from footbridge.

Diversions.—Low-water discharge of two main branches is diverted into Makawao ditch about three-fourths mile above station. An irrigation ditch diverts most of the low-water discharge at a point about 100 feet below the gage.

Accuracy.—Records fair.

Cooperation.—Maintained in cooperation with the Kaneohe Ranch Co.

Discharge measurements of Makawao Stream in Kailua Valley, near Kailua, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	G. K. Larrison	0.94	1.92	Sept. 9	J. C. Dort	0.90	1.81
June 4	do	1.37	9.11	Dec. 10	G. R. White	1.32	7.09

Daily discharge, in second-feet, of Makawao Stream in Kailua Valley, near Kailua, Oahu, for 1912–13.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1912.			1912.			1912.		
1		11	11		2.2	21	1.3	1.7
2		27	12	1.0	2.3	22	1.3	2.1
3		44	13	1.0	2.2	23	1.1	1.8
4		4.4	14	1.1	1.9	24	1.1	1.8
5		3.7	15	1.1	1.9	25	1.1	1.7
6		1.4	16	1.1	1.9	26	1.1	1.7
7		2.1	17	1.0	1.9	27	1.1	1.7
8		2.3	18	1.0	2.2	28	1.6	1.7
9		2.6	19	1.1	2.2	29	1.3	1.7
10		2.2	20	1.0	1.9	30	1.1	1.7
						31		

Daily discharge, in second-feet, of Makawao Stream in Kailua Valley, near Kailua, Oahu, for 1912–13—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	.....	2.2	3.1	2.3	1.9	2.7	2.5	2.1	2.3	1.6	1.6	2.5
2	.....	2.2	3.6	2.3	2.5	2.8	3.4	1.9	3.4	1.6	1.6	2.1
3	.....	2.1	2.7	2.5	1.9	20	2.5	2.1	2.1	1.7	1.6	2.5
4	.....	1.9	2.9	2.5	1.9	17	2.5	1.9	2.1	1.6	1.6	27
5	.....	3.1	2.7	2.9	1.7	4.3	2.3	1.7	1.7	1.6	1.6	26
6	.....	11	2.9	3.4	1.7	3.8	2.1	1.7	1.8	1.6	1.4	9.2
7	.....	6.8	1.9	3.1	2.1	3.7	2.3	1.9	1.7	1.6	1.4	23
8	.....	4.1	1.8	2.5	2.1	3.6	2.3	2.1	1.6	1.6	1.7	13
9	.....	3.2	1.9	2.3	2.9	3.0	2.3	2.1	1.6	1.6	1.3	8.1
10	.....	2.5	2.2	2.1	3.6	3.1	2.3	1.9	1.6	1.6	1.6	6.5
11	.....	1.6	1.9	2.1	2.0	3.0	2.3	1.9	1.6	1.6	1.6	5.4
12	.....	1.4	1.6	2.2	48	2.9	2.1	4.1	1.6	1.6	1.5	4.8
13	.....	.9	1.1	2.4	12	3.1	2.1	2.9	1.7	1.6	1.6	4.4
14	1.1	1.6	1.3	2.1	15	3.1	2.5	2.1	1.7	1.6	1.5	3.7
15	1.1	2.5	1.1	2.1	16	3.1	2.5	1.9	1.7	1.6	1.4	3.6
16	19	11	1.0	6.1	3.4	3.2	2.2	1.9	1.6	1.6	1.6	3.1
17	1.6	14	14	2.8	4.4	2.8	2.4	2.3	1.6	1.6	1.6	3.6
18	1.4	14	5.1	2.1	4.0	2.6	2.3	2.5	1.6	1.6	1.6	4.1
19	16	9.9	4.6	2.0	3.6	2.7	2.3	2.2	1.6	1.6	1.7	4.1
20	7.6	11	3.6	1.8	2.5	3.1	2.1	2.1	1.6	1.6	2.3	4.0
21	15	9.4	3.1	1.9	2.6	2.9	1.9	2.1	1.6	1.6	2.3	3.7
22	2.9	6.3	2.3	2.1	2.4	2.5	1.9	1.9	1.7	1.5	2.3	3.6
23	2.7	3.2	1.8	1.9	2.3	2.3	1.9	2.1	1.9	1.7	1.9	3.4
24	2.5	2.7	3.1	1.9	2.3	2.4	1.9	2.1	1.7	1.8	1.7	3.1
25	2.1	4.1	2.8	1.9	2.6	2.4	1.9	2.1	1.7	1.7	2.1	3.1
26	2.6	4.1	3.2	1.7	2.4	2.5	1.9	2.1	1.6	1.6	4.8	2.8
27	1.9	3.6	4.4	1.6	2.5	2.4	1.9	2.0	1.6	1.6	1.9	3.1
28	1.9	2.9	3.6	1.6	2.4	2.5	2.1	2.0	1.6	1.7	1.7	3.1
29	2.2	.....	2.6	1.7	2.4	2.6	2.1	1.9	1.6	1.6	1.6	3.1
30	2.2	.....	2.6	.8	2.4	2.4	1.9	2.0	1.6	1.4	1.9	3.1
31	3.2	.....	2.5	.....	2.6	.....	1.9	2.1	.....	1.4	.....	3.1

NOTE.—No record January 1–13.

Monthly discharge of Makawao Stream in Kailua Valley, near Kailua, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 14–31	19	1.1	4.83	172	B.
February	14	.9	5.14	285	B.
March	14	1.0	3.00	184	B.
April	6.1	.8	2.29	136	B.
May	48	1.7	5.16	317	B.
June	20	2.3	3.95	235	B.
July	3.4	1.9	2.21	136	B.
August	4.1	1.9	2.12	130	B.
September	3.4	1.6	1.76	105	B.
October	1.8	1.4	1.60	98	B.
November	4.8	1.3	1.80	107	B.
December	27	2.1	6.32	389	B.
The period	.....	.....	.....	2,290	

KAIMI STREAM IN KAILUA VALLEY, NEAR KAILUA, OAHU.

Location.—At highway bridge on Waimanalo-Honolulu government road, about 12½ miles east of Honolulu.

Records available.—November 12, 1912, to December 31, 1913.

Gage.—Vertical staff, read twice daily. Datum raised 1.00 foot April 10, 1913; that is, 1.50 feet gage height previous to April 10 equals 0.50 foot gage heights after that date.

Control.—Fairly permanent.

Discharge measurements.—During low water, made by wading; during floods, from bridge.

Diversions.—Headwaters diverted by Makawao ditch.

Accuracy.—Records poor.

Cooperation.—Maintained in cooperation with the Kaneohe Ranch Co.

Discharge measurements of Kaimi Stream in Kailua Valley, near Kailua, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	G. K. Larrison	0.75	1.12	Sept. 9	J. C. Dort	0.82	1.07
June 4	do	1.08	5.55				

Daily discharge, in second-feet, of Kaimi Stream in Kailua Valley, near Kailua, Oahu, for 1912–13.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1912.			1912.			1912.		
1		18	11		1.5	21	1.5	2.6
2		1.7	12	1.0	.8	22	1.6	2.5
3		21	13	1.0	.8	23	1.3	2.4
4		4.3	14	1.0	.8	24	1.1	2.6
5		4.0	15	1.8	2.4	25	1.2	2.6
6		1.9	16	1.0	2.5	26	1.1	2.6
7		2.4	17	1.0	2.6	27	1.6	2.6
8		2.5	18	1.0	2.5	28	2.8	2.0
9		2.5	19	1.1	3.4	29	2.6	2.0
10		2.6	20	1.0	2.5	30	1.9	2.0
						31		2.4

Daily discharge, in second-feet, of Kaimi Stream in Kailua Valley, near Kailua, Oahu, for 1912–13—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	.....	2.0	2.9	1.4	1.2	1.5	1.9	1.6	3.2	1.4	1.4	2.9
2	.....	2.0	2.8	1.4	2.2	1.5	2.4	1.5	4.3	1.4	1.5	2.5
3	.....	1.7	2.4	1.4	1.3	12	1.7	1.5	1.9	1.4	1.5	2.6
4	.....	1.7	2.4	1.4	1.2	9.6	1.8	1.5	1.5	1.4	1.5	23
5	.....	3.2	2.8	1.7	1.5	3.6	1.8	1.5	1.7	1.4	1.5	24
6	.....	10	2.4	2.2	1.2	4.8	1.7	1.4	1.6	1.4	1.4	15
7	.....	8.4	1.9	1.7	1.4	4.1	1.5	1.4	1.7	1.5	1.5	25
8	.....	3.4	1.6	1.2	15	3.6	1.7	1.5	1.6	1.5	2.9	13
9	.....	2.4	1.4	.9	16	2.4	1.7	1.4	1.4	1.4	2.4	7.8
0	.....	1.5	2.4	1.0	14	2.5	1.5	1.5	1.5	1.5	1.7	5.5
11	.....	.9	2.4	1.2	1.4	2.8	1.5	1.4	1.5	1.5	1.7	5.2
12	.....	1.2	1.7	1.7	26	2.9	1.5	2.9	1.4	1.5	1.7	4.1
13	.....	.7	1.6	3.8	10	4.0	1.5	1.9	1.5	1.5	1.7	4.0
14	0.8	1.4	1.4	1.2	18	4.1	1.5	1.4	1.6	1.5	1.5	3.6
15	.8	2.6	.9	1.2	19	4.5	1.5	1.4	1.5	1.5	1.5	3.5
16	10	12	.8	4.8	3.5	4.1	1.5	1.5	1.4	1.5	1.6	3.2
17	1.2	7.0	14	1.3	5.0	2.5	1.6	2.2	1.4	1.4	1.7	4.3
18	1.2	5.0	5.0	1.1	4.1	1.9	1.5	2.2	1.4	1.5	1.7	5.2
19	10	3.8	3.8	.9	3.8	2.0	1.5	1.5	1.7	1.4	2.2	5.2
20	2.6	3.8	2.8	1.1	3.6	7.6	1.4	1.6	1.7	1.4	3.2	5.2
21	2.6	5.0	2.2	.9	1.9	2.2	1.5	1.5	1.7	1.5	3.2	5.2
22	2.6	3.8	1.4	.9	1.7	2.2	1.4	1.3	1.7	1.5	3.4	4.8
23	2.1	3.5	.9	1.2	1.7	1.9	1.4	1.4	1.9	1.5	2.9	4.5
24	2.6	2.6	1.7	1.2	1.7	1.6	1.4	1.4	1.5	1.5	2.2	4.5
25	2.4	5.0	1.2	1.0	1.6	1.6	1.4	1.4	1.9	1.5	2.9	4.3
26	3.4	4.8	1.5	1.4	1.4	1.7	1.4	1.4	1.6	1.4	9.0	4.1
27	2.9	3.8	3.8	1.4	1.4	1.7	1.2	1.4	1.6	1.4	2.4	4.0
28	2.6	3.2	3.5	1.4	1.5	1.7	1.5	1.4	1.2	1.5	2.5	4.1
29	2.8	.....	2.4	1.2	1.4	1.9	1.5	1.4	1.3	1.5	2.3	3.8
30	2.6	.....	2.0	1.1	1.4	1.8	1.5	1.4	1.2	1.4	2.4	4.0
31	3.4	.....	1.6	.....	1.4	.....	1.5	1.4	.....	1.4	.....	4.1

NOTE.—No record Jan. 1–13, 1913.

Monthly discharge of Kaimi Stream in Kailua Valley, near Kailua, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 14-31	10	0.8	3.15	112	C.
February	12	.7	3.80	211	C.
March	14	.8	2.57	158	C.
April	4.8	.9	1.48	88.1	C.
May	26	1.2	5.37	330	C.
June	12	1.5	3.34	199	C.
July	2.4	1.2	1.56	95.9	C.
August	2.9	1.3	1.55	95.3	C.
September	4.3	1.2	1.70	101	C.
October	1.5	1.4	1.45	89.2	C.
November	9.0	1.4	2.30	137	C.
December	25	2.5	6.85	421	C.
The period	.....	.....	.....	2,040	

KAMAKALEPO STREAM IN KAILUA VALLEY, NEAR KAILUA, OAHU.

Location.—At highway bridge on Waimanalo-Honolulu government road, and about 3½ miles from Waimanalo.

Records available.—November 12 to December 3, 1912; April 9 to December 31, 1913.

Gage.—Vertical staff bolted to left abutment of bridge, installed April 10, 1913, to replace original gage washed out December 3, 1912; new datum.

Control.—Shifting.

Discharge measurements.—Made by wading or from highway bridge.

Diversions.—None above station.

Accuracy.—Records good.

Cooperation.—Station maintained in cooperation with Kaneohe Ranch Co.

Discharge measurements of Kamakalepo Stream in Kailua Valley, near Kailua, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	G. K. Larrison	1.29	1.33	Sept. 9	J. C. Dort	1.30	1.74
June 4	do	1.50	4.91	Dec. 10	G. R. White	1.60	7.35

Daily discharge, in second-feet, of Kamakalepo Stream in Kailua Valley, near Kailua, Oahu, for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.3	1.7	2.4	2.1	2.6	0.9	0.5	3.7
2	.....	2.1	1.9	3.9	2.0	6.3	.8	.6	3.1
3	.....	1.4	17	2.4	1.9	2.2	.7	.5	4.3
4	.....	1.5	19	1.9	1.9	1.6	.7	.5	12
5	.....	1.5	2.4	1.7	1.9	1.6	.7	.5	13
6	.....	1.2	2.6	1.7	1.6	1.6	.7	.5	19
7	.....	1.5	2.8	1.6	1.9	1.4	.8	.5	26
8	.....	12	2.5	1.6	1.6	1.6	.7	1.4	13
9	1.6	16	3.1	1.9	1.4	1.5	.6	1.1	7.8
10	1.4	6.1	3.3	1.6	1.5	1.5	.8	.6	5.4
11	1.5	2.2	3.1	1.5	1.6	1.4	.9	.7	3.3
12	2.1	36	3.1	1.6	2.4	1.4	.7	.7	2.8
13	4.5	18	3.1	1.6	1.9	1.4	.7	.7	2.4
14	1.5	18	2.9	1.9	1.3	1.6	.6	.7	1.9
15	1.7	16	2.9	2.1	1.4	1.6	.6	.8	1.3
16	2.2	2.4	3.3	1.7	1.6	1.4	.6	.9	1.2
17	2.1	4.3	2.9	1.7	2.2	1.3	.6	.9	2.1
18	2.0	3.3	2.8	1.9	2.4	1.2	.6	1.2	2.9
19	1.6	3.3	2.9	2.1	1.6	1.6	.6	1.2	2.6
20	1.7	2.9	9.5	1.6	1.6	1.6	.6	2.0	2.4
21	1.4	2.8	3.1	1.6	1.6	1.4	.6	1.2	2.4
22	1.4	2.6	2.6	1.5	1.5	1.5	.6	1.2	2.2
23	1.7	2.8	2.5	1.4	1.5	1.7	.7	1.2	2.1
24	1.6	2.6	2.6	1.3	1.6	1.3	.8	1.6	2.1
25	1.7	2.5	2.4	1.4	1.4	1.6	.9	4.1	1.9
26	1.5	2.2	2.5	1.4	1.6	1.5	.6	8.9	1.6
27	1.5	1.9	2.4	1.4	1.6	1.4	.6	4.5	1.6
28	1.5	2.0	2.4	1.5	1.4	1.0	.6	3.7	1.6
29	1.5	2.0	2.5	1.5	1.6	1.1	.6	2.4	1.5
30	1.4	2.0	2.4	1.5	1.4	1.1	.6	3.3	1.5
31	.....	1.9	.....	1.6	1.4	.....	.6	.....	1.6

Monthly discharge of Kamakalepo Stream in Kailua Valley, near Kailua, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 9–30	4.5	1.4	1.78	77.6	B.
May	36	1.2	5.69	350	B.
June	19	1.7	3.94	234	B.
July	3.9	1.3	1.76	108	B.
August	2.4	1.3	1.69	104	B.
September	6.3	1.0	1.67	99.4	B.
October	.9	.6	.68	41.8	B.
November	8.9	.5	1.62	96.4	B.
December	26	1.2	4.85	298	B.
The period				1,410	

POHAKEA STREAM IN KAILUA VALLEY, NEAR KAILUA, OAHU.

Location.—One-half mile above highway bridge on the Waimanalo road.

Records available.—November 12, 1912, to December 31, 1913.

Gage.—Vertical staff, read twice daily; datum changed November 24, when 1-foot sharp-crested weir was established. Gage heights from November 25 to December 31 show head on crest of weir.

Control.—Fairly permanent.

Discharge measurements.—Made by wading with current-meter until November 24, after which low-water discharge was measured by sharp-crested weir (1-foot crest) with end contractions.

Diversions.—None above station; two small ditches below.

Accuracy.—Records poor.

Cooperation.—Maintained in cooperation with the Kaneohe Ranch Co.

Discharge measurements of Pohakea Stream in Kailua Valley, near Kailua, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	G. K. Larrison	1.20	0.24	Sept. 9	J. C. Dort	1.16	0.22
June 4	do	1.68	1.50				

Daily discharge, in second-feet, of Pohakea Stream in Kailua Valley, near Kailua, Oahu, for 1912–13.

Day.	Nov.	Dec.	Day.	Nov.	Dec.	Day.	Nov.	Dec.
1912.			1912.			1012.		
1		1.34	11		0.33	21	0.19	0.25
2		.24	12	0.08	.28	22	.17	.24
3		1.51	13	.08	.33	23	.14	.23
4		.90	14	.06	.28	24	.11	.23
5		.82	15	.12	.25	25	.11	.23
6		.49	16	.08	.25	26	.10	.23
7		.49	17	.08	.25	27	.10	.20
8		.42	18	.06	.24	28	.11	.20
9		.37	19	.07	.24	29	.23	.20
10		.34	20	.07	.23	30	.13	.20
						31		.20

Daily discharge, in second-feet, of Pohakea Stream in Kailua Valley, near Kailua, Oahu, for 1912–13—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	.....	0.13	0.24	0.29	0.20	0.28	0.28	0.20	0.28	0.19	0.15	0.44
2	.....	.13	.25	.33	.23	.29	.29	.19	.45	.17	.15	.39
3	.....	.12	.24	.34	.22	1.72	.23	.17	.20	.17	.15	.72
4	.....	.11	.25	.33	.20	2.02	.23	.20	.19	.17	.14	.66
5	.....	.15	.23	.38	.20	.74	.23	.20	.20	.17	.12	.72
6	.....	.90	.20	.45	.20	.31	.22	.18	.20	.17	.12	.66
7	.....	.98	.15	.38	.19	.52	.23	.18	.22	.17	.15	.66
8	.....	.44	.14	.33	.23	.42	.23	.19	.22	.17	.25	.84
9	.....	.29	.16	.28	2.02	.35	.23	.19	.20	.17	.22	.91
10	.....	.22	.19	.28	1.44	.40	.22	.19	.20	.17	.16	1.11
11	.....	.15	.17	.22	.35	.42	.22	.17	.19	.17	.15	1.04
12	.....	.17	.15	.25	1.72	.42	.20	.28	.19	.17	.15	.94
13	.....	.15	.11	.42	1.07	.42	.20	.19	.19	.17	.15	.91
14	0.16	.16	.11	.22	.98	.42	.22	.18	.20	.16	.14	.78
15	.16	.17	.11	.23	1.11	.42	.22	.17	.20	.15	.14	.63
16	.64	1.20	.11	.30	.45	.37	.20	.22	.19	.15	.14	.57
17	.22	1.72	1.54	.20	.59	.35	.20	.23	.18	.15	.14	.49
18	.20	1.54	.71	.23	.45	.31	.20	.25	.19	.15	.15	.44
19	.22	1.30	.49	.22	.38	.33	.20	.19	.22	.14	.19	.44
20	.22	1.04	.38	.23	.40	.50	.19	.19	.22	.14	.28	.44
21	.23	.90	.35	.23	.34	.38	.20	.21	.22	.15	.23	.39
22	.25	.76	.28	.22	.28	.31	.19	.17	.21	.15	.28	.39
23	.20	.49	.24	.22	.28	.30	.20	.19	.22	.16	.23	.39
24	.20	.35	.38	.22	.25	.31	.17	.17	.20	.17	.22	.34
25	.17	.52	.33	.24	.25	.33	.19	.17	.19	.16	.47	.30
26	.20	.35	.44	.22	.23	.30	.19	.17	.19	.15	.66	.32
27	.15	.33	1.54	.22	.23	.27	.20	.20	.19	.15	.49	.30
28	.11	.29	1.40	.22	.23	.27	.21	.20	.19	.16	.39	.30
29	.13	.....	.87	.22	.23	.28	.19	.20	.19	.17	.30	.30
30	.12	.....	.54	.20	.23	.28	.19	.20	.17	.16	.37	.28
31	.20	.....	.34	.....	.29	.....	.19	.20	.....	.15	.....	.25

NOTE.—No record Jan. 1–13, 1913.

Monthly discharge of Pohakea Stream in Kailua Valley, near Kailua, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 14–31	0.64	0.11	0.21	7.49	C.
February	1.72	.11	.54	30.0	C.
March	1.54	.11	.41	25.2	C.
April	.45	.20	.27	16.1	C.
May	2.02	.19	.50	30.7	C.
June	2.02	.27	.47	28.0	C.
July	.29	.19	.21	12.9	C.
August	.28	.17	.19	11.7	C.
September	.45	.17	.21	12.5	C.
October	.19	.14	.16	9.84	C.
November	.66	.12	.23	13.7	C.
December	1.11	.25	.56	34.4	C.
The period	.....	.....	.....	233	

SOUTH BRANCH OF KAHANAIKI STREAM IN KAILUA VALLEY, NEAR KAILUA, OAHU.

Location.—About 300 feet above junction of two main branches, 600 feet above bridge on government road, and 4 miles northwest (by road) from Waimanalo.
Records available.—April 10 to December 31, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made by wading.
Diversions.—None above station; small ditch 100 feet below station.
Accuracy.—Records poor.
Cooperation.—Station maintained in cooperation with the Kaneohe Ranch Co.

Discharge measurements of South Branch of Kahanaiki Stream in Kailua Valley, near Kailua, Oahu, in 1913.

Date.	Made by—	Gage helght.	Dis-charge.	Date.	Made by—	Gage height.	Dis-charge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	G. K. Larrison	0.47	0.19	Sept. 9	G. K. Larrison	0.34	0.20
June 4	.....do	.84	1.79				

Monthly discharge of South Branch of Kahanaiki Stream in Kailua Valley, near Kailua, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accu-racy.
	Maximum.	Minimum.	Mean.		
April 10–30	0.6	0.3	0.41	17.0	D.
May	4.4	.2	1.01	62.1	D.
June	3.4	.2	.70	41.7	D.
July	.5	.2	.27	16.6	D.
August	1.1	.2	.54	33.2	D.
September	2.0	.1	.32	19.0	D.
October	.1	.05	.07	4.3	D.
November	1.2	.05	.30	17.9	D.
December	4.3	.2	.88	54.1	D.
The period				266	

NORTH BRANCH OF KAHANAIKI STREAM IN KAILUA VALLEY, NEAR KAILUA, OAHU.

Location.—About 400 feet above junction of two main branches, 700 feet above bridge on government road, and 4 miles northwest of Waimanalo.
Records available.—April 11 to December 31, 1913.
Gage.—Vertical staff up to November 25; November 26 to December 31, 1913, head read on weir crest.
Control.—Probably permanent.
Diversions.—Small ditch diverts about 0.3 second-foot at point about 400 feet above station, to left.
Discharge measurements.—Made by current-meter until November 25; November 25 to December 31 by 1.0-foot sharp-crested weir.
Accuracy.—Records poor until November 25; November 26 to December 31, good.
Cooperation.—Station maintained in cooperation with the Kaneohe Ranch Co.

Discharge measurements of North Branch of Kahanaiki Stream in Kailua Valley, near Kailua, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 11	G. K. Larrison	0.95	0.11	Sept. 9	J. C. Dort	1.05	0.54
June 4	do	1.28	2.76				

Monthly discharge of North Branch of Kahanaiki Stream in Kailua Valley, near Kailua, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 9–30	0.40	0.01	0.17	7.42	C.
May	3.00	.05	.49	30.1	C.
June	8.20	.10	1.04	61.9	C.
July	.30	.03	.17	10.5	C.
August	.20	.04	.06	3.69	C.
September	1.50	.05	.43	25.6	C.
October	.15	.07	.09	5.53	C.
November	.75	.07	.24	14.3	C.
December	2.20	.45	1.07	65.8	B.
The period				225	

NOTE.—Apr. 9 to Aug. 31, Sept. 3–4, and Sept. 24 to Nov. 7, the Kahanaiki ditch diverted about 0.3 second-foot from the stream above the station. Water overflowed weir Dec. 10–18; discharge estimated.

WAIAHOLE STREAM AT MANIANIAULA, NEAR WAIKANE, OAHU.

Location.—In upper Waiahole Valley, at boundary line of government and private land, 3½ miles southwest of Waikane.

Records available.—September 25, 1911, to December 31, 1913.

Gage.—Vertical staff; read twice daily.

Control.—Probably shifting.

Discharge measurements.—Made by wading.

Diversions.—None above gage.

Regulation.—Flow regulated by large springs at head of Waiahole Valley.

Accuracy.—Records good.

Discharge measurements of Waiahole Stream at Manianiaula, near Waikane, Oahu, in 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 1	J. C. Dort	0.96	23.4	Aug. 15	G. K. Larrison	1.29	37.2
May 3	do	.96	20.4	Sept. 12	G. R. White	1.39	43.0
June 30	G. K. Larrison	.99	22.3	Oct. 1	do	1.30	40.1
Aug. 8	J. C. Dort	1.26	37.6	Dec. 9	J. C. Dort	1.30	39.5

Daily discharge, in second-feet, of Waiahole Stream at Manianiaula, near Waikane, Oahu, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	18	19	20	20	20	21	22	26	47	44	37	37
2	18	20	20	20	20	21	23	32	49	44	37	37
3	18	20	20	20	20	30	22	34	49	44	37	38
4	18	20	20	20	20	27	22	35	47	44	37	37
5	18	20	20	20	20	22	22	35	46	44	37	37
6	18	28	20	20	20	22	22	35	46	44	37	37
7	18	22	20	20	20	22	22	37	46	43	37	37
8	18	22	20	19	20	22	22	37	46	42	38	38
9	18	22	20	19	20	22	21	37	46	41	37	39
10	18	21	20	19	21	22	21	37	45	40	37	39
11	18	21	20	19	20	22	21	38	44	39	37	39
12	18	20	20	20	22	22	21	39	44	39	37	39
13	18	20	20	21	22	24	21	38	44	39	37	39
14	18	20	20	21	46	22	21	39	44	39	37	39
15	18	21	20	21	23	22	21	38	44	39	37	39
16	19	21	20	20	22	22	21	41	45	39	37	39
17	19	21	20	20	22	22	22	91	45	39	37	38
18	19	21	20	20	21	22	22	41	45	39	38	38
19	100	21	20	20	21	22	22	43	49	39	38	38
20	22	21	20	20	21	22	22	43	47	38	38	38
21	22	21	20	20	21	22	22	43	47	38	38	38
22	22	21	20	20	21	22	21	44	47	38	38	38
23	19	21	20	20	21	22	21	45	46	39	37	38
24	19	21	21	20	20	22	21	46	45	38	37	38
25	19	21	21	20	20	22	22	47	45	38	37	38
26	19	21	21	20	20	22	22	47	45	38	37	38
27	19	21	21	20	21	22	22	47	45	37	37	38
28	19	21	21	20	21	22	22	47	45	37	37	38
29	19	.....	20	20	21	22	22	47	45	37	37	38
30	19	.....	20	20	21	22	22	47	45	37	37	38
31	19	.....	20	.....	21	.....	22	47	.....	37	.....	38

NOTE.—Beginning Aug. 1, water developed in the Waiahole Tunnel was wasted into this stream.

Monthly discharge of Waiahole Stream at Manianiaula, near Waikane, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	100	18	21.4	1,320	A.
February	28	19	21.0	1,170	A.
March	21	20	20.2	1,240	A.
April	20	19	20.0	1,190	A.
May	46	20	21.6	1,330	A.
June	30	21	22.4	1,330	A.
July	23	21	21.7	1,330	A.
August	91	26	42.0	2,580	A.
September	49	44	45.8	2,730	A.
October	44	37	39.8	2,450	A.
November	38	37	37.2	2,210	A.
December	39	37	38.1	2,340	A.
The year	100	18	29.3	21,200	

RIGHT BRANCH OF NORTH FORK OF KAUKONAHUA STREAM NEAR WAHIAWA, OAHU.

Location.—About 8 miles northeast of Wahiawa. and 200 feet up the Right Branch from the intake of the Waialua Agricultural Co. tunnel, which is at the confluence of the Right and Left Branches or two main branches of the North Fork.

Records available.—May 29 to December 31, 1913.

Gage.—Stevens continuous water-stage recorder.

Control.—Probably permanent.

Discharge measurements.—Made by wading or from a footbridge about 20 feet above gage.

Diversions.—None above station.

Accuracy.—Records fair.

Cooperation.—The Waialua Agricultural Co. appropriated sufficient funds to cover cost of equipment and installation of station.

Discharge measurements of Right Branch of North Fork of Kaukonahua Stream, near Wahiawa, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 30	J. C. Dort	2.00	10.8	Oct. 1	G. R. White	1.30	0.54
30	do	1.78	5.76	31	J. C. Dort	1.35	.98
July 11	do	1.57	2.89	Nov. 11	do	3.44	120
Aug. 21	G. K. Larrison	1.55	2.79	20	G. R. White	2.49	34.7
Sept. 1	J. C. Dort	3.18	92.8	26	J. C. Dort	3.88	190

Daily discharge, in second-feet, of Right Branch of North Fork of Kaukonahua Stream, near Wahiawa, Oahu, for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.0	11	1.4	6.2	0.8	1.1	8.5
2	.....	3.7	36	1.3	3.8	.8	3.7	7.4
3	.....	4.2	27	1.3	3.2	.8	3.3	40
4	.....	30	10	1.2	2.2	.8	1.6	55
5	.....	6.8	86	1.2	2.1	.8	1.4	21
6	.....	5.0	9.1	1.2	2.0	.8	1.4	43
7	.....	4.8	7.4	1.2	1.8	.8	4.5	27
8	.....	4.7	6.8	1.2	1.6	.7	15	14
9	.....	4.5	5.4	1.4	1.6	.6	34	11
10	.....	4.0	4.2	3.8	1.6	.6	45	9.1
11	.....	3.5	3.1	1.8	1.4	1.1	87	8.0
12	.....	3.6	2.9	67	1.4	28	114	7.4
13	.....	4.7	2.9	2.5	1.4	9.6	72	6.8
14	.....	10	2.8	2.1	1.5	2.7	20	5.7
15	.....	25	3.1	1.7	2.2	1.7	14	5.4
16	.....	5.9	2.3	2.8	2.1	1.3	9.9	5.0
17	.....	9.9	2.2	8.3	1.6	1.2	8.1	5.2
18	.....	5.9	2.3	3.2	1.6	1.0	7.2	5.6
19	.....	4.8	2.4	2.2	4.1	1.0	16	5.0
20	.....	4.0	2.0	2.0	1.8	1.3	104	3.9
21	.....	6.8	1.9	2.9	1.6	2.8	56	3.8
22	.....	9.1	1.7	2.5	1.9	3.7	20	3.6
23	.....	35	1.8	2.2	.7	2.8	15	3.1
24	.....	9.1	1.8	2.5	.7	1.8	16	2.7
25	.....	6.3	2.0	1.7	.7	3.2	80	2.5
26	.....	5.2	2.3	1.4	.7	3.6	79	2.5
27	.....	4.9	4.0	1.4	.8	1.6	46	2.4
28	.....	5.0	2.8	3.2	.8	1.3	32	2.3
29	9.6	10	2.6	3.3	.8	1.2	20	2.2
30	8.1	15	3.3	2.1	.8	1.0	16	2.2
31	4.4	.....	1.8	4.4	.....	1.0	.....	1.9

NOTE.—No records June 21–July 10, Sept. 24–30, and Dec. 1–30; discharge estimated by comparison with records of station on Left Branch of North Fork of the Kaukonahua.

Monthly discharge of Right Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 29–31	9.6	4.4	7.37	43.8	
June	35	3.5	8.51	506	C.
July	86	1.7	8.22	504	C.
August	67	1.2	4.40	271	B.
September	6.2	.7	1.82	108	B.
October	28	.6	2.59	159	B.
November	141	1.1	32.3	1,920	A.
December	55	1.9	10.4	640	C.
The period				4,150	

NOTE.—Actual maximum, Nov. 20, 10 p. m., 600 second-feet., actual minimum, Sept. 27, 29, and Oct. 11, 0.6 second-feet.

LEFT BRANCH OF NORTH FORK OF KAUKONAHUA STREAM NEAR WAHIAWA, OAHU.

Location.—About 8 miles east by north of Wahiawa and 100 feet above the intake of the Waialua Agricultural Co 's tunnel, which is at the confluence of the right and left branches or the two main branches of the North Fork.

Records available.—May 25 to December 31, 1913.

Gage.—Stevens continuous water-stage recorder.

Control.—Probably permanent.

Diversions.—None above station.

Discharge measurements.—Made by wading or from cable.

Accuracy.—Records good.

Cooperation.—The Waialua Agricultural Co. appropriated sufficient funds to cover the cost of equipment and installation of station.

Discharge measurements of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, in 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
May 23	J. C. Dort	1.39	6.31	Sept. 1	J. C. Dort	2.08	41.6
24	do	1.62	14.9	1	do	2.52	94.6
24	do	1.78	20.5	Oct. 1	G. R. White	1.08	.93
27	do	1.40	7.26	31	J. C. Dort	1.00	.99
July 11	do	1.39	6.01	Nov. 20	G. R. White	2.70	94.1
Aug. 31	do	1.60	12.1	20	do	2.27	60.2
Sept. 1	do	1.25	2.95	26	J. C. Dort	3.00	167

Daily discharge, in second-feet, of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.6	20	3.6	13	1.3	0.9	15
2	.....	4.2	63	3.3	6.9	1.3	14	13
3	.....	4.8	47	3.1	7.7	1.1	1.4	70
4	.....	26	18	3.0	5.1	1.1	1.4	96
5	.....	7.7	15	2.8	4.2	1.1	1.4	37
6	.....	10	16	3.0	4.1	1.1	1.4	75
7	.....	9.1	13	3.0	3.3	1.1	1.4	47
8	.....	7.2	12	2.8	3.0	21	1.2	24
9	.....	6.2	9.4	3.8	2.8	33	1.0	19
10	.....	5.9	7.4	12	2.8	7.2	1.0	16
11	.....	7.4	6.4	4.1	2.7	4.1	1.9	14
12	.....	6.9	6.2	40	2.8	3.3	49	13
13	.....	6.2	5.9	7.2	2.5	2.7	17	12
14	.....	11	5.7	8.3	2.7	2.3	4.7	10
15	.....	21	5.7	5.7	3.4	2.3	3.0	9.4
16	.....	12	5.5	7.2	2.7	2.8	2.3	8.8
17	.....	30	4.4	20	2.3	8.3	2.1	9.1
18	.....	15	4.4	8.3	2.2	5.1	1.7	9.8
19	.....	9.1	4.4	6.2	11	3.6	1.7	8.8
20	.....	9.4	4.2	4.8	3.4	3.8	2.3	6.9
21	.....	12	4.1	11	2.4	9.8	4.9	6.6
22	.....	16	3.4	5.9	2.3	3.9	6.5	6.4
23	.....	61	3.4	5.3	3.9	2.8	4.9	5.5
24	.....	16	3.6	5.3	1.5	2.7	3.2	4.8
25	5.7	11	6.9	4.2	1.5	6.6	5.6	4.4
26	5.5	9.1	9.8	3.9	1.3	2.8	137	4.4
27	5.5	8.6	13	3.8	1.2	2.3	46	4.2
28	5.3	8.8	17	4.1	1.3	1.9	28	4.1
29	4.4	18	12	3.4	1.2	1.8	20	3.8
30	7.2	27	6.2	2.8	1.3	1.5	20	3.8
31	5.3	.....	4.4	8.3	.....	1.6	.....	3.4

NOTE.—Discharge Nov. 3–25 estimated by comparison with records of the station on the Right Branch of the North Fork of the Kaukonahua.

Monthly discharge of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 24–31	7.2	4.4	5.56	77.1	
June	61	4.2	13.4	797	A.
July	63	3.4	11.5	707	A.
August	40	2.8	6.78	417	A.
September	13	1.2	3.54	211	B.
October	33	1.1	4.69	288	B.
November	137	.9	12.9	768	C.
December	96	3.4	18.2	1,120	A.
The period	.....	.....	.....	4,390	

NOTE.—Actual maximum for year, Nov. 20, 10 p. m., 750 second-feet; actual minimum for year, Nov. 1, 0.9 second-feet.

SOUTH FORK OF KAUKONAHUA STREAM NEAR WAHIAWA, OAHU.

Location.—About 10 miles east of Wahiawa by main road to United States Army reservoir and trail up ditch bank to about one-eighth mile above the United States Army ditch intake.

Records available.—June 18 to December 31, 1913.

Gage.—Stevens continuous water-stage recorder.

Control.—Probably permanent.

Discharge measurements.—Made by wading or from cable just above gage house.

Diversions.—None above station. Small ditch diverts water one-eighth mile below station for the supply of Schofield Barracks.

Accuracy.—Records fair.

Cooperation.—The Quartermaster Department, United States Army, appropriated sufficient funds to cover the cost of equipment and installation of this station.

Discharge measurements of South Fork of Kaukonahua Stream near Wahiawa, Oahu, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 18	J. C. Dort	1.66	4.27	Oct. 9	J. C. Dort	1.55	3.08
July 9	do	1.63	5.42	Nov. 11	G. R. White	2.21	39.2
Sept. 13	G. R. White	1.47	1.41	Nov. 21	do	2.00	29.6
Sept. 24	J. C. Dort	1.46	1.14	Dec. 17	do	1.58	6.66

Daily discharge, in second-feet, of South Fork of Kaukonahua Stream near Wahiawa, Oahu, for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		27	1.1	2.0	1.2	0.6	63	16		4.8	3.8	2.0	1.2	7.7	7.8
2		43	.9	2.0	.8	.7	57	17		4.5	3.8	4.8	1.1	7.0	6.7
3		28	.7	2.0	.8	9.6	51	18		4.3	4.0	16	1.2	7.4	5.9
4		11	.7	2.0	.7	2.2	45	19		4.0	4.3	4.5	1.1	14	5.2
5		15	.7	2.0	.7	1.1	39	20	23	3.8	4.5	3.2	.7	111	4.9
6		11	.8	2.0	.9	1.0	33	21	9.6	3.2	2.2	2.5	.7	43	4.9
7		7.7	1.2	2.0	2.2	1.1	30	22	7.0	3.0	3.0	7.4	.7	9.8	4.3
8		8.0	1.2	2.0	18	13	26	23	6.1	2.7	12	3.8	.7	41	4.0
9		5.8	.9	2.0	6.4	88	22	24	5.4	2.5	2.2	1.8	1.1	119	4.0
10		5.1	1.8	2.2	2.0	37	20	25	5.4	5.4	1.8	2.2	4.8	29	3.8
11		4.8	2.2	2.5	1.4	28	17	26	5.1	4.3	2.0	1.2	1.1	92	3.6
12		4.8	35	3.0	1.1	66	15	27	11	7.4	2.2	1.0	.8	86	3.3
13		4.8	7.7	2.0	2.0	35	13	28	17	12	1.4	.9	.8	80	3.1
14		4.8	3.0	1.8	3.5	13	11	29	7.4	6.4	2.7	.9	1.2	74	2.9
15		4.8	3.2	2.7	1.6	8.8	9.4	30	9.6	2.7	2.2	1.0	.7	68	2.7
								31		2.0	2.0		.7		2.5

NOTE.—Discharge estimated Nov. 27 to Dec. 5, and Dec. 18.

Monthly discharge of South Fork of Kaukonahua Stream near Wahiawa, Oahu, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 20-30	23	5.1	9.69	211	B.
July	43	2.0	8.34	513	B.
August	35	.7	3.72	229	B.
September	16	.9	2.85	170	B.
October	18	.7	2.00	123	B.
November	119	.6	36.5	2,170	C.
December	63	2.5	16.8	1,030	C.
The period				4,450	

MISCELLANEOUS MEASUREMENTS.

Measurements of streams on the island of Oahu at points other than regular gaging stations are listed below:

Miscellaneous discharge measurements on Oahu in 1913.

Date.	Stream.	Locality.	Gage height.	Discharge.
			Feet.	*Sec.-ft.*
Mar. 27	Waialua artesian well, in flume	Waialua		0.79
Do	Waialua artesian well, ditch	do		1.29
Do	Hauula artesian well	Hauula		1.02
Mar. 28	Lung Do Y artesian well	Honolulu		1.28
Apr. 4	Drain from Young Hotel artesian well	do		.60
Do	Alakea Street flood sewer	Alakea and Merchant Streets, Honolulu.		.75
Do	do	Alakea and Queen Streets, Honolulu.		.59
Do	do	Opposite Hawaii Electric Co. plant, Honolulu.		4.25
Do	do	100 feet above outlet, Honolulu		5.36
Apr. 11	Main Kahanaiki	Kailua Valley	0.92	1.00
Do	Kahanaiki ditch [a]	do	.82	.31
Do	Wong Leong's ditch [b]	do	1.92	4.66
May 15	Paumalu Gulch	Three-fourths mile below intake, Pupukea.		.13
Do	do	Above intake, Pupukea		.11
Do	Paumalu Stream	Below Pupukea pipe, Pupukea		.08
May 30	Waiomao Stream	Above outlet of Kaau Crater		.05
Do	do	300 feet below outlet, Kaau Crater.		.27
Do	do	Top of lower falls		.29
Do	do	900 feet elevation		.41
June 2	Kalihi Stream	Upper Kalihi Valley		2.36
June 3	Artesian well, on Bishop estate land	Below Kamehameha School		1.88
June 4	Kahanaiki ditch [a]	Kailua Valley	.60	.27
July 1	Branch Kahana Stream	Weir No. 12 Kahana Valley		.74
Do	Main Branch Kahana Stream	Weir No. 5 Kahana Valley		5.91
Do	Branch Kahana Stream	Weir No. 2 Kahana Valley		.35
July 2	Waihee Stream [c]	Upper Waiahole Valley		3.74
Do	Waianu Stream [c]	Weir No. 2 Waianu Valley		3.72
Do	Uwau Stream [d]	At weir, Waianu Valley		.48
Do	Waiawa Stream	Above intake, Waiawa Valley		2.80
Aug. 8	Portal of tunnel	Waiahole	1.94	25.5
Aug. 15	do	do	2.10	26.0
Sept. 9	Wong Leong's ditch [b]	Kailua Valley	1.49	4.22
Sept. 12	Portal of tunnel	Waiahole	2.20	31.7
Oct. 22	do	do	1.96	25.8
Oct. 31	do	do	2.03	22.4
Dec. 5	Keaahala Spring [e]	Kaneohe		.48
Jan. 25	Pukele Stream [f]	Below Mahoe Springs, Palolo	.62	.50
Feb. 26	do	do	.66	.54
Mar. 29	do	do	.64	.62
Apr. 13	do	do	1.58	19.2
June 24	do	do	.74	1.01
Feb. 26	Waioma Stream [f]	Above Pukele, Palolo	1.10	.42
Mar. 29	do	do	1.12	.62
Apr. 13	do	do	1.80	17.8
Feb. 1	Waiahole Stream	At Waiahole, near Waikane	1.08	28.8
Aug. 8	do	do		43.4
Apr. 2	Lulumaha Stream [g]	Near Honolulu	1.60	.51
Apr. 14	do	do	1.66	.62
May 23	do	do	1.61	.70
Sept. 12	do	do	1.49	.60
Nov. 10	do	do	1.71	1.78

[a] Diverts from Kahanaiki Stream.
[b] Diverts from Kailua Stream.
[c] Tributary to Waiahole Stream.
[d] Tributary to Waianu Stream.
[e] Tributary to Kaneohe Stream.
[f] Tributary to Palolo Stream.
[g] Tributary to Nuuanu Stream.

ISLAND OF MAUI.

IAO STREAM NEAR WAILUKU, MAUI.

Location.—About 3 miles west of Wailuku and one-fourth mile below the forks of the stream.
Records available.—May 7, 1910, to December 31, 1913.
Gage.—Friez water-stage recorder.
Control.—Fairly permanent.
Discharge measurements.—Made by wading or from cable.
Diversions.—None above station.
Accuracy.—Records good.

Discharge measurements of Iao Stream near Wailuku, Maui, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 17	C. T. Bailey	2.86	33.0	Dec. 4	C. T. Bailey	5.25	758
Aug. 12	Bailey and Christiansen	4.08	213				

Daily discharge, in second-feet, of Iao Stream near Wailuku, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	18	64	29	.....	59	92	22	35	18	12	54
2	.....	12	65	25	76	65	93	22	56	15	92	46
3	.....	12	65	22	.....	60	72	25	40	16	138	164
4	20	16	60	22	.....	56	54	23	28	19	66	553
5	19	54	61	.....	.....	64	118	28	26	40	35	270
6	18	85	62	.....	.....	66	58	28	26	40	25	254
7	18	131	66	.....	.....	60	44	30	30	43	54	148
8	18	141	65	.....	.....	49	31	27	30	36	341	108
9	20	47	64	.....	.....	90	31	51	26	26	530	83
10	20	39	59	.....	.....	59	31	32	30	25	173	66
11	19	33	56	.....	38	61	31	212	25	25	159	59
12	40	27	52	.....	134	105	54	170	27	11	146	52
13	145	26	51	338	124	72	42	75	27	71	108	51
14	157	26	70	308	290	100	37	64	22	30	69	89
15	124	74	108	326	177	122	34	82	22	18	55	69
16	44	65	132	216	119	92	32	183	25	13	111	54
17	32	60	54	181	159	75	32	93	60	11	104	66
18	26	244	29	122	132	67	30	65	66	11	183	93
19	.....	236	26	72	138	65	75	54	36	10	121	60
20	.....	141	26	66	94	66	78	43	30	10	111	54
21	.....	105	28	76	82	66	45	60	33	10	108	58
22	.....	76	79	71	74	78	37	45	30	10	66	56
23	.....	65	28	.....	79	82	49	42	30	9	49	58
24	.....	82	25	.....	79	76	47	34	28	9	126	44
25	.....	141	34	.....	69	83	40	27	27	9	159	49
26	.....	82	25	.....	96	79	35	34	27	10	141	54
27	.....	69	25	.....	85	254	24	27	27	10	54	51
28	.....	64	40	.....	85	155	25	44	21	8	44	55
29	.....	.....	22	.....	69	79	23	30	19	7	183	54
30	.....	.....	27	.....	65	150	22	19	19	6	64	52
31	22	.....	47	.....	60	.....	21	13	.....	6	.....	51

NOTE.—No record Jan. 1–3, 19–30; Apr. 5–12, 23–30; May 1, 3–10.

Monthly discharge of Iao Stream near Wailuku, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 4–18, 31	157	18	46.3	1,470	B.
February	244	12	77.5	4,300	B.
March	132	22	52.1	3,200	B.
April 1–4, 13–22	338	22	134	3,720	B.
May 2, 11–31	290	38	106	4,620	B.
June	254	49	85.2	5,070	B.
July	118	21	46.3	2,850	B.
August	212	13	55.0	3,380	B.
September	66	19	30.9	1,840	B.
October	71	6	18.8	1,160	B.
November	530	12	121	7,200	B.
December	553	44	95.9	5,900	B
The period				44,700	

MANIANIA DITCH NEAR WAILUKU, MAUI.

Location.—About 2½ miles west of Wailuku and 800 feet below intake.
Records available.—October 18, 1910, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from plank footbridge above 50 feet above gage.
Accuracy.—Records fair.

Discharge measurements of Maniania ditch near Wailuku, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 17	1.07	22.8	May 1	1.56	33.2
Apr. 8	.74	15.8			

Monthly discharge of Maniania ditch near Wailuku, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	28	14	19.5	1,200	C.
February	26	5.0	13.5	750	C.
March	28	15	21.7	1,330	C.
April	31	17	24.1	1,430	C.
May	30	10	23.9	1,470	C.
June	31	22	26.6	1,580	C.
July	32	23	27.5	1,690	C.
August	32	20	26.5	1,630	C.
September	34	17	22.8	1,360	C.
The period				12,400	

SOUTH WAIEHU STREAM NEAR WAILUKU, MAUI.

Location.—About 3 miles west of Wailuku and 300 feet above South Waiehu ditch intake.

Records available.—March 19 to December 31, 1913.

Gage.—Vertical staff.

Control.—Shifting.

Discharge measurements.—Made from footbridge or by wading.

Diversions.—One small taro ditch, carrying about 0.2 second-foot at ordinary stages, diverts water above the gage.

Accuracy.—Records for March, July, August, and October, good; for other months, poor.

Discharge measurements of South Waiehu Stream near Wailuku, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 18	0.58	4.91	June 28	0.54	3.02
Mar. 21	.76	8.01	July 31	.53	2.73

Daily discharge, in second-feet, of South Waiehu Stream near Wailuku, Maui, for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.8	3.8	3.8	2.4	3.4	3.6	6.3	5.6	7.1
2	.....	4.2	4.4	3.8	2.8	6.0	92	6.3	8.8	7.7
3	.....	3.8	3.8	4.2	3.0	7.4	6.5	7.1	58	76
4	.....	4.2	3.8	3.8	3.0	3.4	3.6	4.4	5.1	177
5	.....	3.8	3.8	3.8	3.0	4.7	3.6	5.6	4.0	185
6	.....	3.8	3.8	3.8	3.0	4.9	3.8	8.8	4.0	143
7	.....	3.8	3.8	3.8	2.8	5.4	20	4.7	76	44
8	.....	3.8	3.8	3.8	2.8	4.7	6.0	4.7	137	8.0
9	.....	3.8	3.8	3.8	3.0	5.6	3.8	4.7	58	5.6
10	.....	3.8	3.8	4.7	2.8	5.8	3.8	4.7	8.8	4.9
11	.....	30	3.8	3.8	5.1	7.7	4.7	4.7	5.1	5.1
12	.....	14	116	4.7	4.7	12	3.8	4.7	5.1	5.1
13	.....	49	128	4.7	4.2	3.4	4.4	4.7	5.1	4.2
14	.....	5.6	92	3.8	3.8	5.6	3.8	4.7	4.7	78
15	.....	17	17	3.8	3.8	5.4	3.8	4.7	4.7	10
16	.....	29	4.7	3.8	3.4	14	5.1	5.1	4.7	9.4
17	.....	58	4.2	3.8	3.0	4.9	11	4.2	4.9	9.1
18	.....	38	3.8	3.8	2.6	3.8	11	4.7	42	6.5
19	3.8	4.4	3.8	3.8	6.0	3.8	5.1	5.6	48	6.8
20	3.8	3.8	3.8	3.8	5.1	3.8	4.2	6.0	8.2	6.0
21	3.8	8.8	3.8	3.8	4.7	5.1	4.2	6.5	6.3	6.3
22	8.8	8.8	3.8	3.8	4.7	3.8	3.4	4.0	4.9	4.9
23	3.8	4.4	3.8	3.8	4.7	4.0	4.2	6.5	5.1	4.7
24	3.8	3.8	3.8	3.8	4.4	4.0	3.8	3.8	6.8	4.7
25	3.8	3.8	3.8	3.8	3.4	4.0	4.7	4.0	5.1	4.7
26	3.8	3.8	3.8	3.8	2.6	4.0	4.7	4.2	6.0	4.7
27	3.8	3.8	6.8	62	3.4	5.1	4.7	4.2	4.4	4.7
28	6.0	3.8	10	3.8	6.0	4.7	4.9	4.2	4.2	4.7
29	3.8	3.8	5.6	3.8	3.6	4.7	4.9	4.2	4.2	4.7
30	5.1	3.8	3.8	4.7	4.7	4.0	4.9	4.0	4.7	4.7
31	3.8	.....	3.8	.....	5.4	10	.....	4.0	.....	5.1

Monthly discharge of South Waiehu Stream near Wailuku, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 19–31	8.8	3.8	4.45	115	A.
April	58	3.8	11.2	666	D.
May	128	3.8	15.1	928	D.
June	62	3.8	5.87	349	D.
July	6	2.4	3.80	234	A.
August	14	3.4	5.45	335	A.
September	92	3.4	8.27	492	D.
October	8.8	3.8	5.03	309	A.
November	137	4.0	18.3	1,090	D.
December	185	4.2	27.5	1,690	D.
The period				6,210	

SOUTH WAIEHU DITCH NEAR WAILUKU, MAUI.

Location.—About 1½ miles northwest of Wailuku, one-fourth mile above Waihee canal crossing, in flume 60 feet below intake.
Records available.—July 13, 1912, to December 31, 1913.
Gage.—Vertical staff.
Control.—Fairly permanent.
Diversions.—Ditch diverts all low-water flow.
Discharge measurements.—Made from 2 by 4 at gage.
Accuracy.—Records good.

Discharge measurements of South Waiehu ditch near Wailuku, Maui, in 1912–13.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1912		*Feet.*	*Sec.-ft.*	1913		*Feet.*	*Sec.-ft.*
July 13	J. B. Stewart	0.48	4.16	Mar. 15	C. T. Bailey	0.72	9.98
July 16	do	.45	3.79	Mar. 19	do	.36	2.51
Sept. 6	do	.42	3.47	Mar. 21	do	.50	4.57
Nov. 21	do	.48	4.27				

Daily discharge, in second-feet, of South Waiehu ditch near Wailuku, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.0	3.0	3.0	2.8	2.8	2.8	3.2	2.8	2.5	3.0	3.2	4.6
2	3.0	3.0	3.0	3.0	3.2	2.8	4.6	3.3	15	3.0	5.0	5.0
3	4.6	3.0	3.0	2.8	2.8	3.0	2.6	3.6	4.6	3.5	7.3	7.5
4	3.8	3.0	3.0	3.0	2.8	2.8	2.6	2.6	2.5	3.2	3.2	13
5	3.0	3.8	3.0	2.8	2.8	2.8	2.6	3.2	2.5	2.8	2.8	10
6	3.0	17	3.0	2.8	2.8	2.8	2.6	3.0	2.6	5.9	2.8	13
7	3.0	15	4.6	2.8	2.8	2.8	2.8	3.3	9.4	3.0	5.7	9.9
8	3.0	19	3.0	2.8	2.8	2.8	2.8	3.2	3.0	3.0	10	5.3
9	3.0	3.8	3.0	2.8	2.8	2.8	2.6	3.3	2.6	2.8	9.9	3.6
10	3.0	3.0	3.0	2.8	2.8	3.3	2.6	4.3	2.6	2.8	4.6	3.2
11	3.0	3.0	3.0	12	2.8	2.8	2.8	4.1	2.9	2.8	2.9	3.3
12	3.0	3.0	3.0	9.9	6.4	3.3	3.2	7.8	2.6	2.8	3.0	3.3
13	3.0	3.0	3.0	12	7.1	3.3	3.0	2.6	2.9	2.8	3.0	2.8
14	3.0	3.0	3.0	4.3	12	2.8	3.3	3.5	2.4	3.0	3.0	8.6
15	3.0	3.0	5.7	8.9	12	2.8	3.3	3.5	2.4	2.8	3.0	6.8
16	3.0	4.6	3.8	10	3.3	2.8	3.3	9.4	3.0	3.0	3.0	6.4
17	3.0	6.8	4.6	12	4.6	2.8	3.0	3.2	4.0	2.8	3.2	6.1
18	3.0	6.8	3.8	8.4	2.8	2.8	2.6	2.6	5.3	2.8	8.1	4.3
19	3.0	12	2.8	3.2	2.8	2.8	5.0	2.6	3.3	2.9	7.3	4.4
20	3.0	4.6	2.8	2.8	2.8	2.8	3.3	2.6	2.8	3.0	5.3	4.0
21	3.0	3.0	2.8	6.4	2.8	2.8	2.8	3.3	2.8	3.2	4.1	4.1
22	3.0	3.0	6.0	6.4	2.8	2.8	2.5	2.6	2.4	2.7	3.3	3.2
23	3.0	3.0	2.8	3.2	2.8	2.8	2.5	2.7	2.7	3.2	3.3	3.0
24	3.0	3.0	2.8	2.8	2.8	2.8	3.0	2.7	2.6	2.8	4.1	3.0
25	3.0	4.6	2.8	2.8	2.8	2.8	2.8	2.7	2.9	2.8	3.3	3.0
26	3.0	3.0	2.8	2.8	2.8	2.8	2.7	2.7	2.9	2.8	4.0	3.0
27	3.0	3.0	2.8	2.8	4.0	7.3	2.8	3.0	2.8	2.8	2.9	3.0
28	3.0	3.0	4.3	2.8	6.4	2.8	3.5	3.0	2.9	2.8	2.8	3.0
29	3.0	.....	2.8	2.8	4.0	2.8	3.2	3.0	3.0	2.8	2.9	3.0
30	3.0	.....	5.7	2.8	2.8	3.3	3.3	2.7	3.0	2.7	3.0	3.0
31	3.0	.....	2.8	.....	2.8	.....	3.2	6.8	.....	2.7	.....	3.3

Monthly discharge of South Waiehu ditch near Wailuku, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	4.6	3.0	3.08	189	A.
February	19	3.0	5.32	295	A.
March	6	2.8	3.40	209	A.
April	12	2.8	4.92	293	A.
May	12	2.8	3.93	242	A.
June	7.3	2.8	3.02	180	A.
July	5	2.5	3.04	187	A.
August	9.4	2.6	3.54	218	A.
September	15	2.4	3.56	212	A.
October	5.9	2.7	3.00	184	A.
November	10	2.8	4.33	258	A.
December	13	2.8	5.15	317	A.
The year	19	2.4	3.83	2,780	

NORTH WAIEHU STREAM NEAR WAILUKU, MAUI.

Location.—One mile above Waihee canal crossing and about 2½ miles northwest of Wailuku; 50 feet above uppermost diversion.
Records available.—July 9, 1912, to December 31, 1913.
Gage.—Vertical staff.
Control.—Probably shifting.
Discharge measurements.—Made by wading.
Diversions.—None above station.
Accuracy.—Records doubtful.
Cooperation.—Station is maintained in cooperation with Wailuku Sugar Co.

Discharge measurements of North Waiehu Stream near Wailuku, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 14	0.60	3.58	July 3	0.62	3.92
Apr. 10	.59	3.89	Aug. 14	.60	4.69

Daily discharge, in second-feet, of North Waiehu Stream near Wailuku, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.2	4.2	4.2	4.2	4.2	4.2	5.2	4.2	4.5	4.2	4.5	7.1
2	4.7	4.2	4.2	4.2	6.5	4.5	7.4	4.7	12	4.5	4.5	6.3
3	4.7	4.2	4.2	4.2	4.2	4.7	5.5	5.0	5.5	9.0	4.5	6.5
4	4.5	4.2	4.2	4.2	4.2	4.7	4.2	4.2	4.7	6.8	4.5	22
5	4.2	4.2	4.2	4.2	4.2	4.2	4.5	4.2	4.2	6.5	4.5	12
6	4.2	4.2	4.2	4.2	4.2	4.2	4.7	4.2	3.9	6.5	4.5	14
7	4.2	10	7.4	4.2	4.2	4.2	4.7	4.2	5.2	6.3	5.5	8.7
8	4.2	5.5	4.5	4.2	4.2	4.2	4.7	4.2	4.2	5.8	20	7.4
9	4.2	5.5	4.2	4.2	4.2	4.2	4.7	4.2	4.0	5.2	16	7.4
10	4.2	5.5	4.2	3.5	4.5	5.0	4.5	5.2	4.0	5.0	7.8	7.4
11	4.2	5.5	4.2	12	4.2	4.5	4.2	4.2	4.0	4.7	7.1	7.4
12	4.2	5.5	4.2	7.4	8.7	4.7	4.2	6.3	4.2	4.2	7.4	7.4
13	4.2	5.5	4.2	6.0	5.2	7.1	5.8	4.2	4.2	4.2	6.8	7.4
14	4.5	5.5	4.2	5.2	4.7	14	4.7	4.5	4.2	4.2	6.3	14
15	4.2	5.5	12	12	4.7	6.8	4.5	4.7	4.2	4.2	6.3	8.4
16	4.2	5.5	5.5	8.4	5.8	4.7	4.5	8.7	4.2	4.2	6.8	7.8
17	4.2	4.7	4.2	7.1	4.5	4.5	4.5	4.2	4.5	4.2	6.8	7.8
18	4.2	7.4	4.2	6.3	4.2	4.5	4.5	4.0	5.8	4.2	12	7.8
19	4.2	9.4	4.2	4.2	4.2	4.7	7.1	4.0	4.5	4.2	8.1	7.8
20	4.2	4.7	4.2	4.7	4.2	4.5	4.7	4.0	4.5	4.2	8.4	7.8
21	4.2	4.2	4.2	5.8	4.2	4.5	4.7	4.0	4.5	4.2	6.5	7.8
22	4.2	4.2	8.1	6.3	4.2	4.5	4.7	4.0	4.5	4.2	6.3	7.8
23	4.2	4.2	4.7	6.3	4.2	4.5	4.7	4.0	4.5	4.2	6.3	7.8
24	4.2	4.2	4.2	4.2	4.2	4.5	4.7	4.0	4.5	4.2	6.8	7.4
25	4.2	4.5	4.2	4.2	4.2	4.5	4.7	4.0	4.5	4.2	6.8	7.4
26	4.2	4.2	4.2	4.2	4.7	4.5	4.7	3.9	4.5	4.2	6.0	7.4
27	4.2	4.2	4.2	4.2	4.2	6.3	4.2	3.9	4.5	4.2	6.5	7.4
28	4.2	4.2	4.7	4.2	4.5	4.7	4.2	4.0	4.5	4.2	6.3	7.4
29	4.2	.....	4.2	4.2	4.2	4.7	4.7	3.9	4.5	4.2	6.3	7.4
30	4.2	.....	4.2	4.2	4.2	6.3	5.2	3.9	4.5	4.2	6.3	7.4
31	4.2	.....	4.2	.....	4.2	.....	5.2	10	.....	4.2	.....	7.4

Monthly discharge of North Waiehu Stream near Wailuku, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	4.7	4.2	4.25	261	C.
February	10	4.2	5.17	287	C.
March	12	4.2	4.76	293	C.
April	12	3.5	5.41	322	C.
May	8.7	4.2	4.58	282	C.
June	14	4.2	5.10	303	C.
July	7.4	4.2	4.85	298	C.
August	10	3.9	4.60	283	C.
September	12	3.9	4.72	281	C.
October	9.0	4.2	4.79	295	C.
November	20	4.5	7.21	429	C.
December	22	6.3	8.55	526	C.
The year	22	3.5	5.33	3,860	

WAIHEE STREAM NEAR WAIHEE, MAUI.

Location.—About 300 feet above Waihee canal intake, 3 miles west of Waihee, and 7 miles northwest of Wailuku.

Records available.—April 1 to December 31, 1913.

Gage.—Barrett & Lawrence water-stage recorder.

Control.—Fairly permanent.

Discharge measurements.—Made from footbridge or by wading.

Diversions.—None above station.

Accuracy.—Records very good except discharge December 5–31, which was estimated.

Discharge measurements of Waihee Stream near Waihee, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 2	2.75	42.2	Aug. 13	3.00	66.5
June 30	3.82	260	Dec. 4	4.08	35.9
July 31	2.78	45.9			

Daily discharge, in second-feet, of Waihee Stream near Waihee, Maui, for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	44	97	49	80	38	46	42	45	56
2	43	84	53	138	56	162	40	127	56
3	40	73	51	66	46	62	40	91	28
4	40	58	51	21	38	50	40	55	584
5	40	54	54	84	37	44	40	40	248
6	39	55	58	69	46	44	41	39	97
7	39	74	55	68	42	54	42	97	57
8	38	62	58	55	39	45	45	468	57
9	48	56	63	50	49	44	43	375	49
10	44	53	68	48	68	43	41	97	46
11	242	52	51	53	97	43	40	114	46
12	91	112	106	116	188	43	42	127	44
13	316	89	89	64	62	44	49	68	44
14	97	116	62	45	56	44	41	54	95
15	248	97	95	47	68	44	41	51	46
16	127	69	62	46	81	46	41	47	44
17	116	112	56	52	49	78	41	46	62
18	56	94	54	60	44	69	43	116	81
19	41	81	53	143	43	43	42	138	44
20	35	49	55	136	44	42	42	80	43
21	73	45	56	54	64	43	44	81	43
22	68	48	54	44	46	44	45	51	43
23	46	51	47	51	46	44	45	46	43
24	62	49	44	58	49	43	44	71	42
25	62	46	48	74	44	43	42	138	42
26	37	67	44	84	48	43	42	87	43
27	39	63	316	51	56	44	42	56	44
28	35	60	127	77	64	44	39	52	45
29	33	55	63	67	45	43	39	53	45
30	49	44	255	74	51	42	38	53	46
31	.....	46	.....	44	53	.....	38	.....	45

NOTE.—Discharge Dec. 5–31 estimated by comparison with record on Iao streaam.

Monthly discharge of Waihee Stream near Waihee, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	316	33	76.3	4,540	A.
May	116	44	68.1	4,190	A.
June	316	44	76.6	4,560	A.
July	143	21	68.4	4,210	A.
August	188	37	56.7	3,490	A.
September	162	42	50.8	3,020	A.
October	49	38	41.7	2,560	A.
November	468	40	98.8	5,880	A.
December	584	28	74.5	4,580	D.
The period	.....	.....	.....	37,000	

SPRECKELS DITCH NEAR WAIHEE, MAUI.

Location.—About 2 miles west of Waihee and about 500 feet below intake.
Records available.—November 16, 1910, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made by wading.
Diversion.—Ditch is second diversion from Waihee Stream.
Accuracy.—Records fair.

Discharge measurements of Spreckels ditch near Waihee, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 5	0.11	0.51
June 30	1.80	68.9

Monthly discharge of Spreckels ditch near Waihee, Maui, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
January	14	0.0	2.24	138	B.
February	64	1.0	18.4	1,060	A.
March	58	7.2	31.4	1,930	A.
April	82	7.2	35.7	2,120	A.
May	70	1.8	13.9	855	B.
June	58	.5	9.04	538	B.
July	73	1.0	16.8	1,030	B.
August	55	.0	10.2	627	B.
September	26	1.0	2.90	173	B.
October	43	1.0	10.7	658	C.
November	67	1.6	19.1	1,140	B.
December	67	1.6	12.8	787	B.
The year	82	.0	15.2	11,100	
1913.					
January	67	1.0	9.84	605	C.
February	58	1.0	13.6	755	C.
March	64	.5	13.6	836	B.
April	67	.5	23.9	1,420	B.
May	43	1.6	11.8	726	C.
June	67	1.2	12.2	726	B.
July	67	.9	9.34	574	B.
August	51	1.4	8.78	540	B.
September	26	.5	2.73	162	B.
The period				6,340	

NOTE.—Ditch dry, Jan. 15–18, 21–24, and Aug. 27–30, 1912.

KAHAKULOA STREAM AT KAHAKULOA, NEAR WAIHEE, MAUI.

Location.—About 13 miles northwest of Wailuku at trail bridge of Kahakuloa, below all diversions.
Records available.—August 27, 1912, to March 31, 1913.
Gage.—Staff gage on left bank, just below trail bridge.
Control.—Probably permanent.
Discharge measurements.—Made by wading.
Accuracy.—Records good.
Station discontinued March 31, 1913, and record continued at new station 3 miles above mouth of stream by water-stage recorder.

Daily discharge, in second-feet, of Kahakuloa Stream at Kahakuloa, near Waihee, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
1	6	3	5	11	5	3	5	21	3	8	5
2	6	3	5	12	5	3	5	22	5	6	25
3	10	3	5	13	21	3	5	33	5	6	7
4	6	3	5	14	18	3	5	24	5	6	5
5	5	3	5	15	10	4	20	25	5	18	10
6	5	137	5	16	8	10	9	26	5	7	5
7	5	36	18	17	6	6	11	27	5	5	5
8	5	26	8	18	4	83	5	28	3	5	9
9	5	6	10	19	3	39	5	29	3	.....	6
10	5	5	5	20	3	10	5	30	3	.....	5
								31	3	.....	5

Monthly discharge of Kahakuloa Stream at Kahakuloa, near Waihee, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	21	3	6.0	369	A.
February	137	3	16.1	894	B.
March	25	5	7.5	461	A.

KAHAKULOA STREAM NEAR HONOKAHAU, MAUI.

Location.—About 12 miles southeast of Honokahau and 3 miles above mouth of stream.
Records available.—January 22 to August 31, 1913.
Gage.—Stevens water-stage recorder.
Control.—Fairly permanent.
Discharge measurements.—Made from footbridge or by wading.
Diversions.—None above station.
Accuracy.—Records for January, June, and July, good; for other months, poor.

Discharge measurements of Kahakuloa Stream near Honokahau, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 23	1.00	1.65	May 21	1.10	2.46
Mar. 9	1.17	3.57	Oct. 5	1.10	2.65

Daily discharge, in second-feet, of Kahakuloa Stream near Honokahau, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	.....	2.4	2.0	.....	3.2	4.0	11	3.0
2	.....	2.0	2.0	.....	3.7	3.6	19	11
3	.....	1.6	1.9	.....	3.2	11	4.7	3.6
4	.....	1.6	2.0	.....	2.8	9.5	3.6	3.0
5	.....	8.2	1.8	.....	2.6	4.4	10	3.4
6	.....	38	1.8	.....	2.5	5.1	5.3	3.8
7	.....	2.2	7.2	.....	8.5	5.8	3.2	3.7
8	.....	2.6	3.0	1.7	5.3	5.3	3.1	8.5
9	.....	3.0	4.0	2.5	25	5.1	2.8	3.1
10	.....	3.4	2.3	2.8	8.2	7.5	3.1	8.5
11	.....	3.7	2.1	59	14	7.5	3.7	11
12	.....	4.1	2.0	34	13	5.1	13	2.2
13	.....	4.5	2.0	86	12	20	5.5	3.7
14	.....	4.9	2.3	26	11	9.8	2.8	3.1
15	.....	5.3	.....	68	9.7	4.2	2.6	2.8
16	.....	5.7	.....	35	8.5	6.9	3.0	2.8
17	.....	6.0	.....	35	7.3	4.0	3.6	2.8
18	.....	6.4	.....	8.2	6.1	3.2	3.1	2.6
19	.....	6.8	.....	8.8	4.9	3.2	5.5	2.6
20	.....	7.2	.....	6.2	3.7	2.8	2.8	.....
21	.....	3.7	.....	32	3.1	2.6	2.6	.....
22	1.6	2.5	.....	18	3.7	3.0	3.0	.....
23	1.6	2.3	.....	8.5	5.8	3.0	3.0	.....
24	1.8	2.2	.....	5.1	3.8	3.1	3.1	.....
25	2.0	8.2	.....	15	3.8	5.1	2.8	.....
26	1.9	3.1	.....	5.5	7.5	3.6	4.7	.....
27	2.0	2.2	.....	7.5	6.9	73	3.4	.....
28	1.9	2.1	.....	3.7	5.5	23	3.4	.....
29	1.6	.....	.....	3.4	7.2	9.8	3.4	.....
30	1.5	.....	.....	3.2	8.2	22	2.8	.....
31	2.0	.....	.....	.....	4.4	.....	2.8	.....

NOTE.—No record Mar. 15 to Apr. 7 and Aug. 20–31.

Monthly discharge of Kahakuloa Stream near Honokahau, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January 22–31	2.0	1.5	1.79	36	A.
February	38	1.6	5.21	289	D.
March 1–14	7.2	1.8	2.60	72	D.
April 8–30	86	1.7	20.7	944	D.
May	25	2.5	6.94	427	D
June	73	2.6	9.14	544	A.
July	19	2.6	4.73	291	A.
August 1–19	11	2.2	4.48	169	D.
The period	.....	.....	.....	2,770	

NOTE.—No record Mar. 15 to Apr. 7. Automatic gage out of order Aug. 20 to Dec. 31, 1913.

HONOKAHAU STREAM NEAR HONOKAHAU MAUI.

Location.—On right bank, 1,000 feet above Honokahau ditch intake, about 6 miles southeast of Honokahau post office.
Records available.—March 6 to December 31, 1913.
Gage.—Stevens water-stage recorder.
Control.—Fairly permanent.
Discharge measurements.—Made from cable 400 feet below gage or by wading.
Diversions.—None above station.
Accuracy.—Records good.

Discharge measurements of Honokahau Stream near Honokahau, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 7	1.19	19.0	July 8	1.21	19.8
8	1.07	17.3	Aug. 22	1.18	19.1
May 21	1.20	20.0	Oct. 4	1.11	17.0

Daily discharge, in second-feet, of Honokahau Stream near Honokahau, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	35	73	20	71	20	.....	18	15	22
2	.....	.....	.....	21	43	20	98	23	.....	16	77	22
3	.....	.....	.....	19	46	21	36	26	.....	16	91	44
4	.....	.....	.....	17	24	22	34	20	.....	18	49	264
5	.....	.....	.....	18	21	24	52	20	.....	17	21	151
6	.....	.....	.....	17	20	28	42	30	.....	44	19	145
7	.....	.....	30	17	24	28	30	26	.....	36	30	55
8	.....	.....	18	17	25	27	24	24	.....	55	195	41
9	.....	.....	19	26	21	33	20	22	.....	19	257	35
10	.....	.....	16	19	.....	43	20	53	.....	16	99	34
11	.....	.....	16	183	.....	22	20	35	.....	16	122	34
12	.....	.....	16	155	.....	68	44	183	.....	16	129	35
13	.....	.....	15	248	.....	75	45	37	.....	49	65	35
14	.....	.....	16	106	.....	28	29	36	.....	43	28	65
15	.....	.....	53	200	.....	62	23	42	.....	22	26	46
16	.....	.....	68	125	24	28	20	58	.....	21	50	32
17	.....	.....	25	129	47	21	20	24	.....	16	57	46
18	.....	.....	19	61	.....	20	20	19	.....	16	117	83
19	.....	.....	17	30	.....	19	36	18	.....	16	123	32
20	.....	.....	17	32	24	18	54	18	.....	16	42	28
21	.....	.....	26	62	22	19	25	22	17	15	89	29
22	.....	.....	90	44	20	20	24	22	17	15	36	27
23	.....	.....	20	61	24	22	26	20	17	15	28	26
24	.....	.....	16	.....	29	21	30	26	16	15	95	26
25	.....	.....	40	.....	23	29	27	22	16	25	135	26
26	.....	.....	16	.....	45	24	25	20	16	18	113	26
27	.....	.....	18	.....	33	127	20	39	16	17	38	25
28	.....	.....	34	24	29	134	24	22	16	18	25	25
29	.....	.....	18	29	27	53	22	.....	18	16	23	25
30	.....	.....	24	22	25	106	21	.....	17	15	22	25
31	.....	.....	55	.....	21	.....	20	.....	.....	15	.....	25

NOTE.—No record Jan. 1 to Mar. 6, Apr. 24–27, May 10–15, 18–19, and Aug. 29 to Sept. 20.

Monthly discharge of Honokahau Stream near Honokahau, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 7–31	90	15	28.1	1,390	B.
April 1–23, 28–30	248	17	66.1	3,400	B.
May 1–9, 16–31	73	20	30.0	1,370	B.
June	134	18	39.4	2,340	B.
July	98	20	32.3	1,990	B.
August 1–28	183	18	33.1	1,840	B.
September 23–30	18	16	16.6	329	B.
October	55	15	21.6	1,330	B.
November	257	15	73.9	4,400	B.
December	264	22	49.5	3,040	B.
The period				21,400	

HONOKAHAU DITCH AT INTAKE, NEAR HONOKAHAU, MAUI.

Location.—About 9 miles by trail above Honokahau, 350 feet below ditch intake.
Records available.—February 3, 1907, to September 6, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from plank at gage.
Diversion.—Ditch diverts total low flow of Honokahau Stream.
Accuracy.—Records good.
Cooperation.—Gage is the property of the Honolua Ranch Co.

Discharge measurements of Honokahau ditch at intake near Honokahau, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Mar. 7	1.88	20.5
July 10	1.88	19.7

Monthly discharge of Honokahau ditch at intake, near Honokahau, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	43	16	21.8	1,340	A.
February	43	16	24.1	1,340	A.
March	43	16	22.5	1,380	A.
April	43	16	30.4	1,810	A.
May	43	19	28.3	1,740	A.
June	43	19	27.9	1,660	A.
July	43	19	27.3	1,680	A.
August	43	18	24.3	1,490	A.
September 1–6	34	18	23.2	276	A.
The period				12,700	

HONOLUA STREAM NEAR HONOKAHAU, MAUI.

Location.—About 2 miles south of Honokahau and 300 feet above Honokahau ditch crossing.

Records available.—March 12 to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably shifting.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records for low and medium stages good; flood records are little more than estimates.

Discharge measurements of Honolua Stream near Honokahau, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 12	0.53	0.74	July 10	0.55	1.45
May 20	.81	4.11	Aug. 22	.46	.78
May 22	.69	2.36			

Daily discharge, in second-feet, of Honolua Stream near Honokahau, Maui, for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.0	2.4	1.2	13	0.8	1.4	0.4	0.6	1.7
2	.....	1.2	3.7	1.2	13	.8	5.4	.4	.7	1.5
3	.....	1.1	4.0	1.4	6.0	4.6	6.0	.4	24	1.5
4	.....	.8	2.6	2.4	5.2	1.0	1.5	.8	4.4	85
5	.....	.4	1.9	1.9	4.1	.8	.8	.6	3.1	55
6	.....	.4	1.4	2.7	6.9	.8	.8	2.8	1.5	51
7	.....	.4	1.3	2.4	3.3	.8	1.0	4.6	1.2	6.9
8	.....	.4	1.6	1.6	2.4	.8	.8	6.0	40	11
9	.....	.4	1.6	2.1	1.7	.7	.7	.8	17	3.8
10	.....	.4	1.2	5.6	1.4	2.4	.8	.8	11	3.0
11	.....	37	1.2	2.2	1.4	2.1	.8	.6	9.6	3.0
12	0.8	22	26	6.5	1.6	43	.8	.6	8.2	3.0
13	.6	56	4.4	13	7.7	4.4	.8	.6	6.2	2.8
14	.5	28	14	2.4	4.1	5.4	.6	5.2	3.7	25
15	12	51	28	5.6	2.1	14	.6	1.2	3.4	8.5
16	15	37	8.3	2.6	1.5	11	.6	1.2	3.0	5.4
17	5.6	27	7.4	1.6	1.3	2.6	.6	.8	3.0	39
18	2.2	15	12	.9	1.2	2.1	2.2	.7	38	6.0
19	1.4	12	18	.7	1.0	1.5	1.4	.5	69	6.9
20	.7	9.1	5.0	.6	4.1	1.3	1.0	.5	3.8	5.2
21	1.0	16	3.2	.5	2.6	.9	.8	.4	3.0	4.3
22	27	10	2.5	.5	1.5	.8	.6	.4	2.2	4.8
23	3.7	15	2.4	.5	1.4	.8	.5	.4	1.7	3.6
24	1.1	7.2	2.6	.5	1.5	.8	.5	.3	3.6	3.3
25	2.9	31	2.6	.5	2.0	.8	.5	24	30	3.0
26	1.4	7.6	2.4	1.0	1.6	.8	.5	2.4	54	2.8
27	1.1	9.1	3.2	14	1.4	1.2	.4	.7	15	2.6
28	2.2	5.4	3.3	24	1.0	5.6	.4	.6	3.4	2.6
29	1.2	5.0	3.2	16	.8	2.1	.4	.5	1.9	2.2
30	.8	4.0	3.4	12	.8	1.1	.4	.4	1.4	2.1
31	3.2	.....	1.6	.....	.8	6.2	.....	.4	.....	2.1

Monthly discharge of Honolua Stream near Honokahau, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 12-31	27	0.5	4.22	168	C.
April	56	.4	13.7	815	D.
May	28	1.2	5.69	350	B.
June	24	.5	4.27	254	B.
July	13	.8	3.17	195	B.
August	43	.7	3.94	242	B.
September	6	.4	1.12	67	B.
October	24	.3	1.94	119	B.
November	69	.6	12.2	726	C.
December	85	1.5	11.6	713	C.
The period				3,650	

HONOKAWAI STREAM NEAR LAHAINA, MAUI.

Location.—Eight miles northeast of Lahaina, 500 feet below junction of Honokawai and Amalu streams.

Records available.—May 13 to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made from footbridge or by wading.

Diversions.—Most of the normal flow is diverted into Honokawai ditch half a mile above gage.

Accuracy.—Low-flow records good; flood discharges only estimates.

Discharge measurements of Honokawai Stream near Lahaina, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 16	1.23	1.06
May 23	.97	.10

Monthly discharge of Honokawai stream near Lahaina, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 13-31	12	0.2	2.41	90.6	C.
June	9.6	.0	1.43	85.1	C.
July	12	.0	1.11	68.2	C.
August	7.0	.0	.66	40.6	C.
September	2.2	.0	.09	5.5	C.
October	10	.0	.48	29.5	C.
November	18	.0	3.76	224	C.
December	21	.0	1.65	101	C.
The period				644	

NOTE.—No discharge during periods as follows: June 1; July 9, 11, 16, 17, 24-31; Aug. 1-9, 11, 18-27, 30; Sept. 1, 2, 4-17, 19-30; Oct. 1-5, 9-12, 15-25, 27-31; Nov. 1, 2, 6, 7, 14, 15, 23, 28-30; Dec. 1-3, 12-14, 16, 19-31.

HONOKAWAI DITCH NEAR LAHAINA, MAUI.

Location.—Two miles above Pioneer Mill Co.'s power house, and about 7 miles northeast of Lahaina; 250 feet below junction with Amalu wooden flume and 1,000 feet below intake.

Records available.—July 1, 1912, to December 31, 1913.

Gage.—A graduated rod gage, which the observer places in the center of flume each time a reading is taken.

Control.—Probably permanent.

Discharge measurements.—Made in flume near gage.

Diversion.—Ditch diverts all low-water flow from Honokawai and Amalu streams.

Accuracy.—Records good except extremely high discharges.

Cooperation.—Station maintained in cooperation with Pioneer Mill Co.

Discharge measurements of Honokawai ditch near Lahaina, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 18	1.20	10.5
Aug. 21	.92	5.24

Daily discharge, in second-feet, of Honokawai ditch near Lahaina, Maui, for 1912–13.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.							1912.						
1	7.9	6.7	6.5	13	7.0	8.9	16	7.5	14	6.2	6.4	22	6.5
2	7.9	6.5	18	6.8	6.5	12	17	6.5	7.9	6.2	6.4	22	6.2
3	8.6	6.5	7.2	6.7	6.2	20	18	6.5	6.7	6.2	6.2	23	5.9
4	7.5	6.5	7.5	6.5	6.0	6.7	19	6.5	6.5	6.2	6.2	11	17
5	8.6	6.5	6.8	7.2	5.9	5.9	20	12	6.5	6.4	6.0	8.7	8.2
6	9.3	6.5	6.8	6.8	6.2	5.9	21	8.2	6.5	7.2	8.6	14	17
7	6.7	7.5	14	6.2	6.2	11	22	7.0	8.6	6.8	20	8.6	22
8	17	7.5	6.7	6.8	6.4	13	23	12	6.8	6.2	10	9.1	15
9	10	13	7.4	6.5	22	6.5	24	6.8	6.5	6.2	8.4	6.8	8.7
10	7.9	16	6.5	6.5	8.9	6.0	25	6.5	6.5	6.2	6.5	6.2	6.5
11	6.7	7.9	6.5	8.9	8.2	5.9	26	6.5	13	6.2	14	6.2	17
12	11	8.2	6.2	7.5	6.5	5.9	27	6.8	9.1	6.2	15	5.9	6.7
13	7.2	7.9	6.2	7.2	6.2	5.9	28	7.2	6.7	6.7	17	6.2	12
14	6.7	8.6	6.2	12	6.2	7.2	29	6.7	9.6	9.1	6.5	5.9	7.0
15	6.5	18	6.2	9.3	6.0	7.2	30	6.7	8.2	10	11	5.8	14
							31	6.8	7.2	.....	22	.....	6.5

Daily discharge, in second-feet, of Honokawai ditch near Lahaina, Maui, for 1912–13—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	6.8	5.3	5.0	15	12	4.9	9.5	5.0	5.3	5.3	5.0	5.8
2	6.4	5.0	5.0	6.5	8.6	4.9	8.9	5.0	5.0	5.2	5.0	5.3
3	17	5.0	5.0	5.6	10	5.6	8.0	5.0	7.9	5.3	16	5.0
4	6.2	5.0	5.0	5.3	6.5	5.0	8.6	5.0	5.6	5.4	14	11
5	5.8	4.9	4.9	5.2	6.5	5.0	8.6	5.2	5.2	5.0	5.9	6.2
6	5.8	10	4.9	5.0	5.3	6.2	8.2	7.9	5.0	7.9	5.3	7.9
7	5.8	6.2	4.9	5.0	5.0	6.5	7.5	5.3	5.0	7.7	5.2	6.5
8	8.2	17	4.9	4.9	6.2	5.8	6.2	6.8	5.3	15	18	5.0
9	8.6	5.6	4.9	6.8	5.0	6.8	5.6	5.0	5.6	6.8	18	6.5
10	10	5.0	4.9	5.0	5.0	6.8	5.3	7.9	5.3	5.0	16	6.8
11	6.5	5.2	4.9	20	6.5	5.3	5.3	5.2	5.2	5.3	16	5.9
12	5.9	5.0	4.8	22	12	7.5	7.2	23	5.9	5.0	19	5.8
13	23	5.0	4.8	22	8.0	8.6	7.5	7.4	5.3	11	13	5.6
14	23	5.0	4.8	21	8.2	6.7	7.5	10	5.0	10	6.5	5.9
15	23	6.5	10	23	3.8	6.5	6.2	9.6	5.3	6.4	6.2	6.2
16	7.7	6.2	13	22	4.8	6.2	5.4	11	6.2	5.3	8.6	5.3
17	6.2	5.3	5.9	21	6.2	5.6	5.3	8.2	9.1	5.0	14	6.8
18	6.0	22	5.6	20	7.0	5.2	5.8	5.3	12	5.0	16	14
19	6.2	17	5.0	8.2	5.0	5.0	7.9	5.0	9.1	5.0	16	8.0
20	5.8	5.9	5.0	8.4	5.8	5.0	6.2	5.0	5.3	4.9	8.6	5.9
21	5.6	5.9	12	8.6	5.3	5.0	6.2	5.0	5.0	5.0	16	5.3
22	5.6	5.3	21	6.7	5.3	5.0	7.0	5.0	5.0	5.0	7.4	5.3
23	5.6	5.0	5.6	8.6	5.4	5.4	6.5	5.0	5.0	5.0	6.2	5.0
24	5.6	5.0	5.0	9.6	7.5	5.6	6.2	5.0	5.0	5.2	12	5.0
25	5.6	12	12	8.9	7.2	6.8	5.8	5.3	4.8	9.1	16	5.0
26	5.6	5.8	5.2	7.2	5.9	5.9	5.3	5.0	4.8	8.4	16	5.3
27	5.6	5.2	5.3	9.6	5.9	11	5.0	10	4.8	5.3	12	5.0
28	5.3	5.0	11	8.2	5.9	17	5.6	11	4.8	5.0	6.2	5.0
29	5.0	.....	5.3	8.6	5.3	7.9	5.0	7.2	5.2	5.0	5.9	5.0
30	5.0	.....	8.9	6.4	5.0	9.5	5.0	5.9	5.3	5.0	5.3	5.0
31	5.4	.....	14	.....	5.0	.....	5.0	13	.....	5.0	.....	5.0

Monthly discharge of Honokawai ditch near Lahaina, Maui, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
July	17	6.5	8.05	495	B.
August	18	6.5	8.52	524	B.
September	18	6.2	7.36	438	B.
October	20	6.0	9.29	571	C.
November	23	5.8	9.19	547	C.
December	22	5.9	9.81	603	C.
The period	.....	.....	.....	3,180	
1913.					
January	23	5.0	8.19	504	B.
February	22	4.9	7.19	399	B.
March	21	4.8	7.05	433	B.
April	23	4.9	11.1	660	C.
May	12	3.8	6.49	399	A.
June	17	4.9	6.61	393	A.
July	9.5	5.0	6.56	403	A.
August	23	5.0	7.26	446	B.
September	12	4.8	5.78	344	A.
October	15	4.9	6.27	386	A.
November	19	5.0	11.2	666	C.
December	14	5.0	6.17	379	A.
The year	23	3.8	7.48	5,410	

KAHOMA DITCH AT WEIR, NEAR LAHAINA, MAUI.

Location.—About 3½ miles east of Lahaina, at portal of the lower of two development tunnels of Pioneer Mill Co.

Records available.—August 1, 1911, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—A 4-foot sharp-crested weir with end contractions; measured discharge from development tunnel and amount diverted by small pipe from stream. Measurements checked by current meter.

Accuracy.—Records very good.

Cooperation.—Records kept by Pioneer Mill Co.

Discharge measurements of Kahoma ditch at weir, near Lahaina, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 14	0.67	7.54
Aug. 19	.42	3.79

Daily discharge, in second-feet, of Kahoma ditch at weir, near Lahaina, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.50	2.76	2.76	6.19	5.58	3.00	6.19	3.37	3.76	3.37	3.37	3.76
2	3.24	2.76	2.88	5.58	4.71	3.00	7.97	3.37	3.50	3.37	3.37	3.76
3	4.02	2.76	2.76	4.43	4.43	3.00	7.64	3.37	4.43	3.37	6.50	3.76
4	3.37	2.64	2.76	3.12	3.63	3.00	7.80	3.37	3.50	3.37	6.19	7.47
5	3.12	2.64	2.76	3.12	3.12	3.00	7.14	3.37	3.50	3.37	4.43	6.50
6	2.88	3.89	2.76	3.00	3.12	3.89	5.88	4.71	3.37	6.82	3.76	6.19
7	2.88	7.64	2.76	3.00	3.12	3.63	5.29	5.73	3.37	5.58	3.50	4.57
8	3.89	3.89	2.76	2.88	3.12	3.63	4.71	4.16	3.37	6.19	6.82	3.89
9	7.14	2.88	2.76	5.58	3.00	4.71	3.63	3.63	3.37	4.43	7.80	3.50
10	6.35	2.88	2.76	3.37	3.00	5.58	3.50	3.50	3.37	3.63	6.82	3.50
11	4.29	2.76	2.76	7.80	3.00	3.63	3.37	3.50	3.37	3.50	6.50	3.37
12	5.29	2.76	2.76	7.80	5.43	4.71	4.99	7.80	3.63	3.50	6.98	3.37
13	7.14	2.76	2.76	7.97	4.85	6.19	5.29	5.58	3.76	5.58	5.58	3.37
14	7.14	2.64	2.76	6.82	6.66	4.43	5.29	5.58	3.63	5.73	4.71	3.37
15	7.47	5.73	4.43	8.14	6.35	5.58	4.43	5.88	3.63	3.76	4.99	3.37
16	4.43	3.00	5.43	7.80	4.43	4.43	3.63	5.43	4.16	3.76	5.88	3.37
17	3.63	2.88	5.14	7.97	3.63	3.37	3.63	4.85	5.58	3.50	6.50	3.37
18	3.12	7.64	3.89	7.14	6.04	3.37	3.50	4.02	7.80	3.50	6.50	6.50
19	3.63	6.66	3.12	5.29	5.73	3.12	5.14	3.63	5.14	3.50	6.98	4.71
20	3.12	3.37	2.88	4.99	3.63	3.12	5.58	3.76	3.76	3.50	5.14	3.89
21	3.12	3.63	6.19	5.73	3.37	3.00	3.89	3.50	3.50	3.50	5.58	3.37
22	2.88	2.88	6.82	4.57	3.37	3.00	3.63	3.50	3.37	3.50	4.57	3.37
23	2.88	2.76	3.63	5.88	3.12	3.00	4.16	3.50	3.37	3.50	4.43	3.37
24	2.88	2.76	3.12	5.29	6.19	3.00	4.71	3.37	3.50	4.71	7.80	3.37
25	2.88	5.58	5.14	6.50	3.50	4.43	3.76	4.02	3.37	5.88	7.47	3.37
26	2.88	4.16	3.12	4.29	5.88	4.99	3.50	3.50	3.37	4.43	7.14	3.37
27	2.88	4.16	4.71	5.58	3.89	5.58	3.50	3.50	3.37	3.63	6.04	3.37
28	2.88	4.16	6.19	6.19	3.37	6.98	3.50	5.58	3.37	3.50	4.43	3.24
29	2.88	.....	3.63	4.99	3.12	5.58	3.37	4.43	3.37	3.50	3.89	3.24
30	2.88	.....	4.43	3.63	3.12	6.19	3.37	4.43	3.37	3.50	3.89	3.24
31	2.88	.....	6.82	.....	3.00	.....	3.37	5.88	.....	3.50	.....	3.24

Monthly discharge of Kahoma ditch at weir, near Lahaina, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	7.47	2.88	3.92	241	A
February	7.64	2.64	3.75	208	A
March	6.82	2.76	3.79	233	A
April	8.14	2.88	5.49	327	A
May	6.66	3.00	4.15	255	A
June	6.98	3.00	4.14	246	A
July	7.97	3.37	4.69	288	A
August	7.80	3.37	4.32	266	A
September	7.80	3.37	3.80	226	A
October	6.82	3.37	4.08	251	A
November	7.80	3.37	5.58	332	A
December	7.47	3.24	3.94	242	A
The year	8.14	2.64	4.30	3,120	

LAHAINALUNA STREAM NEAR LAHAINA, MAUI.

Location.—One-fourth mile above Lahainaluna Seminary, about 1½ miles northeast of Lahaina, and 8 feet above Pioneer Mill Co.'s upper ditch intake. Previous to May 7, 200 feet downstream from present location.

Records available.—August 1, 1911, to December 31, 1913.

Gage.—Vertical staff; datum changed May 7, 1913.

Control.—Shifting.

Discharge measurements.—Made by wading.

Diversions.—Most of the normal flow of the stream is diverted into Lahainaluna ditch about 1 mile above the gage.

Accuracy.—Records good except for flood discharges.

Cooperation.—Station maintained in cooperation with Pioneer Mill Co.

Discharge measurements of Lahainaluna Stream near Lahaina, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 15	1.95	125	May 12	1.18	1.73
Apr. 17	1.45	54.7	May 16	1.40	3.07
May 7[a]	1.02	1.00	Aug. 19	1.18	.96
			Sept. 30	1.15	.91

[a] Gage moved upstream 200 feet; new datum.

Daily discharge, in second-feet, of Lahainaluna Stream near Lahaina, Maui, for 1912–13.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.												
1	2.2	1.2	1.5	7.0	1.8	1.5	2.2	1.1	2.2	3.6	2.0	2.5
2	2.3	2.5	3.6	11	3.4	1.4	1.6	1.1	14	2.8	.7	2.0
3	1.8	2.3	3.9	6.6	1.4	1.3	2.2	1.1	1.4	.9	.7	2.8
4	1.8	1.5	2.0	5.6	2.9	1.3	3.9	1.1	1.8	.5	.6	1.5
5	2.0	1.5	1.8	32	4.4	10	2.0	1.1	.7	.5	.8	1.5
6	1.6	1.4	1.6	16	5.1	1.1	1.1	1.0	16	.7	.8	.8
7	1.6	1.3	3.1	46	1.5	1.1	1.5	1.0	5.8	.7	.7	3.1
8	2.2	1.3	2.3	20	4.2	1.1	1.1	1.4	.9	1.8	1.6	1.0
9	2.0	1.3	4.6	8.8	1.5	2.5	7.6	2.5	1.0	.7	132	1.0
10	1.6	2.0	2.5	7.2	1.5	1.4	1.5	4.6	.5	.8	3.9	1.0
11	1.8	1.3	22	3.5	1.5	1.3	1.5	8.0	.5	.8	5.1	1.0
12	1.8	1.3	3.6	3.2	1.4	1.3	1.3	3.1	.5	.7	2.3	.9
13	1.6	1.3	3.1	3.1	1.3	1.3	2.2	1.0	.5	1.0	1.5	.9
14	1.6	1.2	1.5	8.0	1.3	1.5	1.4	1.0	.5	2.3	1.0	.9
15	1.6	1.2	1.5	1.8	1.3	1.8	1.2	3.5	.5	.7	1.0	1.3
16	1.6	1.2	1.5	1.6	1.3	2.0	1.1	2.0	.5	.8	3.1	1.3
17	1.6	1.2	10	1.9	1.3	1.8	1.3	1.8	.7	.7	5.6	1.3
18	1.5	1.2	6.4	1.8	1.3	1.3	1.1	.5	.7	.7	6.4	1.0
19	1.3	11	1.6	1.5	2.7	1.5	1.1	.5	.9	.7	4.2	2.5
20	1.3	46	2.7	1.5	1.5	1.8	1.0	.5	.8	.7	3.9	2.0
21	1.3	124	1.5	1.5	6.4	8.0	1.3	.5	.8	3.1	4.2	16
22	1.3	55	1.5	3.1	2.8	1.5	1.3	2.0	.8	2.8	2.5	55
23	1.3	8.0	1.3	1.6	1.8	1.6	1.3	1.0	.8	4.2	2.8	29
24	1.3	3.9	1.3	2.8	2.7	5.1	3.6	.5	.8	1.1	.9	3.4
25	1.3	3.6	1.2	8.8	1.5	1.5	1.4	.5	.9	.6	1.0	2.4
26	1.3	3.5	1.2	3.9	3.6	1.5	1.0	.9	.9	8.0	.7	14
27	1.3	100	1.0	2.0	19	1.3	2.0	.5	.9	7.0	.7	2.5
28	1.3	6.8	1.0	1.8	4.4	1.3	1.1	1.1	.9	2.5	1.4	2.0
29	1.2	1.8	1.4	1.5	1.6	1.3	1.1	1.8	1.8	1.3	1.4	2.4
30	1.2	.....	5.1	1.8	1.5	1.3	1.1	2.5	7.2	3.2	1.4	3.1
31	1.2	.....	6.8	.....	1.5	.....	1.0	2.2	.....	78	.....	2.3
1913.												
1	1.3	1.3	1.3	2.4	1.4	1.6	13	1.6	0.7	0.9	0.6	2.0
2	1.3	1.3	1.3	2.2	1.4	1.6	27	1.6	.7	.7	.6	1.7
3	1.2	1.3	1.3	1.6	1.4	1.6	6	1.6	1.0	.9	22	1.2
4	1.2	1.3	1.3	1.4	1.4	1.6	3.4	1.6	.9	.8	20	24
5	1.2	1.3	1.3	1.4	1.4	1.6	26	1.6	.7	.7	1.0	4.0
6	1.1	1.4	1.3	1.3	1.4	2.4	6.0	3.2	.6	8.6	1.0	2.9
7	1.1	1.4	1.3	1.3	1.4	2.7	3.9	2.0	.6	1.0	2.9	2.3
8	1.2	22	1.3	1.3	1.4	2.3	2.6	1.7	.7	15	4.8	2.1
9	1.2	1.4	1.3	2.7	1.4	4.1	1.9	1.6	.6	1.2	57	2.0
10	1.3	1.4	1.3	1.4	1.3	7.9	2.0	2.0	.7	.5	36	1.7
11	1.3	1.3	1.3	78	1.3	1.7	1.9	1.7	1.4	.6	12	1.4
12	1.3	1.3	1.2	44	1.7	5.5	4.8	66	.9	.8	6.3	1.5
13	12	1.3	1.2	85	3.0	6.0	6.3	2.0	2.0	32	4.0	1.6
14	12	1.3	1.2	12	32	1.8	2.8	4.0	.9	4.8	1.4	1.6
15	8.6	1.3	1.5	88	12	1.7	2.3	2.2	.8	1.2	1.4	1.6
16	1.6	1.4	1.4	15	3.9	1.7	1.9	9.8	1.5	.6	12	1.6
17	1.3	1.3	2.2	18	3.5	1.5	1.9	2.3	7.1	.6	17	1.6
18	1.1	8.0	1.4	5.6	4.6	1.5	1.9	.8	30	.7	50	12
19	1.1	7.0	1.4	2.4	5.5	1.4	2.0	1.0	1.1	.6	18	2.4
20	1.0	1.4	1.3	2.4	2.9	1.4	2.3	.9	.7	.7	2.2	1.6
21	1.2	1.5	4.3	2.4	1.9	1.4	1.9	.9	.9	.7	1.6	1.5
22	1.1	1.4	8.0	2.0	1.9	1.4	2.0	.9	.9	.7	1.4	1.5
23	1.1	1.4	1.4	3.6	1.9	1.4	4.4	.9	1.0	.7	1.3	1.5
24	1.2	1.3	1.3	1.7	3.4	1.8	2.2	1.5	.8	.9	9.8	1.5
25	1.2	3.6	2.6	6.4	2.0	2.3	2.3	1.0	.8	22	11	1.5
26	1.2	1.4	1.4	1.8	2.8	3.9	2.0	.8	.7	1.4	23	1.5
27	1.2	1.3	1.9	1.9	2.0	6.2	2.0	.8	.7	.7	4.5	1.5
28	1.2	1.3	4.7	2.2	1.7	21	1.6	1.0	.7	.7	1.7	1.4
29	1.3	.....	1.4	1.6	1.6	3.7	1.5	.8	1.0	.6	1.5	1.4
30	1.3	.....	3.2	1.6	1.6	20	1.5	.9	.8	.6	2.2	1.4
31	1.5	.....	10	.....	1.6	.....	1.5	3.1	.....	.6	.....	1.4

Monthly discharge of Lahainaluna Stream near Lahaina, Maui, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
January	2.3	1.2	1.57	96.5	B.
February	124	1.2	13.4	771	D.
March	22	1.0	3.36	207	C.
April	46	1.5	7.23	430	C.
May	19	1.3	2.88	177	B.
June	10	1.1	2.09	124	B.
July	7.6	1.0	1.74	107	B.
August	8.0	.5	1.66	102	B.
September	16	.5	2.21	132	D.
October	78	.5	4.32	266	D.
November	132	.6	6.50	387	D.
December	55	.8	5.24	322	D.
The year	132	.5	4.31	3,120	
1913.					
January	12	1.1	2.16	133	B.
February	22	1.3	2.60	145	C.
March	10	1.2	2.17	133	C.
April	88	1.3	13.1	778	D.
May	32	1.3	3.44	212	B.
June	21	1.4	3.82	227	B.
July	27	1.5	4.61	283	C.
August	66	.8	3.93	242	B.
September	30	.6	2.06	123	B.
October	32	.6	3.31	204	C.
November	57	.6	10.9	649	D.
December	24	1.2	2.80	172	B.
The year	88	.6	4.56	2,070	

LAHAINALUNA DITCH NEAR LAHAINA, MAUI.

Location.—One and one-half miles east of Lahaina, 200 feet above intake for Lahainaluna School power house.

Records available.—May 6 to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversions.—Ditch diverts nearly all low-water flow from Lahainaluna Stream.

Accuracy.—Records good.

Discharge measurements of Lahainaluna ditch near Lahaina, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 7	0.80	2.85	Sept. 30	0.72	1.92
May 12	.86	3.31	Oct. 3	.76	1.98
Aug. 19	.77	2.04			

Daily discharge, in second-feet, of Lahainaluna ditch near Lahaina, Maui, for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.7	5.2	2.6	2.9	2.1	1.9	2.6
2	.....	2.7	5.4	2.7	2.6	1.5	2.0	2.6
3	.....	3.0	4.3	2.4	2.9	1.6	6.3	2.9
4	.....	2.7	4.6	2.4	1.9	2.1	5.2	8.1
5	.....	2.9	5.5	2.4	2.1	1.6	2.6	6.8
6	2.1	3.2	4.9	4.0	2.1	4.9	2.5	5.2
7	2.6	4.3	4.0	4.3	2.1	3.7	1.9	3.4
8	2.9	4.6	2.9	4.0	2.0	6.1	6.1	2.4
9	2.6	5.4	2.6	3.2	2.0	3.6	7.1	2.4
10	2.9	5.5	2.4	4.0	2.4	3.2	4.0	2.4
11	2.9	4.3	2.4	2.9	3.2	3.4	4.0	2.9
12	6.1	4.3	4.0	7.4	3.2	2.9	2.6	2.5
13	4.6	5.4	4.6	4.9	3.3	4.8	1.4	2.5
14	5.8	4.0	4.3	5.2	2.9	4.0	2.4	2.6
15	3.2	4.0	3.2	5.0	2.4	2.1	2.1	2.9
16	2.1	3.6	2.9	5.8	3.4	2.6	7.4	2.6
17	1.9	2.9	2.7	2.9	5.5	2.4	8.3	2.7
18	2.6	2.9	2.6	2.9	6.8	2.1	10	6.1
19	2.4	2.9	2.7	2.4	4.6	2.0	9.7	4.3
20	2.0	2.9	3.4	2.4	3.7	2.1	6.0	2.6
21	2.5	2.9	2.9	2.2	2.9	1.5	6.1	2.6
22	2.4	2.7	3.6	2.1	1.9	1.4	5.2	2.7
23	2.4	3.0	3.7	2.0	1.9	1.4	4.6	2.6
24	2.9	3.4	3.4	3.0	2.1	2.0	7.1	2.9
25	3.2	4.0	2.7	2.1	1.8	4.0	8.0	2.6
26	3.7	4.6	2.2	2.4	1.9	3.4	8.5	2.5
27	3.4	4.3	2.1	2.6	2.0	2.2	7.1	2.6
28	3.2	5.7	2.5	2.6	1.9	2.1	3.4	2.6
29	3.2	4.0	2.7	2.9	2.1	1.6	2.9	2.6
30	2.9	4.9	2.6	2.1	1.6	1.6	3.2	2.6
31	2.9	.....	2.6	4.8	.....	2.1	.....	2.6

Monthly discharge of Lahainaluna ditch near Lahaina, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May	6.1	1.9	3.05	157	A.
June	5.7	2.7	3.79	226	A.
July	5.5	2.1	3.41	210	A.
August	7.4	2.0	3.31	204	A.
September	6.8	1.6	2.74	163	A.
October	4.9	1.4	2.65	163	A.
November	10	1.4	4.99	297	A.
December	8.1	2.4	3.21	197	A.
The period	.....	.....	.....	1,620	

KAUAULA DITCH NEAR LAHAINA, MAUI.

Location.—About 100 feet below intake which is uppermost on the stream, about 3 miles east of Lahaina.
Records available.—October 16, 1911, to December 31, 1913.
Gage.—Vertical staff.
Discharge measurements.—Made in flume at gage.
Control.—Probably permanent.
Diversion.—Ditch diverts all low flow of Kauaula Stream.
Accuracy.—Records good.
Cooperation.—Station is maintained in cooperation with Pioneer Mill Co.

Discharge measurements of Kauaula ditch near Lahaina, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 15	1.26	14.7	Aug. 19	0.84	7.99
29	.92	10.5			

Daily discharge, in second-feet, of Kauaula ditch near Lahaina, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.5	6.3	6.8	7.5	8.2	6.8	15.0	6.8	7.8	5.9	5.4	10.8
2	7.5	6.0	6.6	6.8	9.2	6.4	12.8	6.8	7.7	5.7	5.4	10.5
3	8.2	6.0	6.0	6.0	9.2	6.4	12.1	6.8	7.7	5.7	15.0	9.9
4	7.5	5.6	6.0	6.0	7.8	6.4	11.4	6.8	7.5	5.7	12.8	16.4
5	6.8	5.6	6.0	4.6	7.5	6.0	15.5	6.8	7.2	5.7	8.0	15.5
6	6.8	5.6	6.0	4.6	7.5	6.3	9.2	6.9	6.9	13.7	8.0	14.6
7	6.4	6.0	6.0	5.0	7.5	6.0	11.0	6.8	6.6	8.0	6.3	13.2
8	6.4	11.9	5.6	5.0	6.8	6.0	9.2	6.8	6.6	12.8	16.0	12.1
9	6.4	9.2	5.4	6.0	6.4	9.2	8.5	6.8	6.6	7.8	16.4	11.4
10	6.4	7.5	5.3	5.3	6.4	11.0	8.2	6.8	6.6	7.2	14.6	10.1
11	6.0	7.5	5.2	18.2	6.4	7.5	7.8	6.8	6.6	6.9	14.6	8.9
12	6.0	6.8	5.0	18.2	8.0	8.4	7.8	15.5	6.6	6.4	13.7	8.4
13	11.9	6.4	4.9	18.2	15.5	10.1	9.9	12.8	6.4	11.0	12.8	8.0
14	12.8	6.4	4.9	11.0	12.8	8.4	7.8	8.9	6.4	14.2	12.4	8.4
15	14.6	6.0	6.0	18.2	12.8	7.5	7.5	9.6	6.3	7.8	12.3	7.8
16	11.9	6.0	7.8	18.2	12.8	9.2	7.4	13.2	6.6	8.0	13.2	7.8
17	9.9	6.3	6.0	18.2	13.4	7.4	7.0	11.0	8.2	6.8	15.0	7.8
18	8.9	7.0	6.0	18.2	12.8	6.8	7.0	9.0	12.4	6.6	15.0	13.7
19	8.7	15.5	5.3	14.6	12.6	6.4	6.9	8.7	8.9	6.4	.....	11.4
20	8.7	8.0	6.8	12.3	11.0	6.3	6.9	8.4	7.5	5.9	4.6	8.0
21	8.7	8.4	6.8	11.0	12.3	6.2	7.0	8.4	7.2	5.7	11.9	7.8
22	7.8	7.0	8.4	11.0	11.0	6.0	7.0	8.2	7.0	5.6	11.5	7.5
23	7.5	6.8	6.4	14.6	10.6	6.0	7.0	8.2	7.5	5.6	11.0	7.2
24	7.2	6.8	6.3	11.0	10.1	5.9	7.2	7.8	7.4	5.6	13.2	7.2
25	6.8	12.8	6.0	13.7	9.2	5.7	7.2	7.4	7.0	9.9	15.5	7.0
26	6.4	8.9	6.0	13.7	8.4	5.7	7.0	7.4	6.9	5.9	15.5	7.0
27	6.3	6.3	6.0	11.9	8.4	5.6	6.9	7.4	6.9	5.9	13.7	6.9
28	6.3	6.0	6.4	9.2	7.5	6.9	6.9	7.2	6.8	5.9	13.3	6.8
29	6.0	.....	6.0	9.2	7.5	18.2	6.9	7.2	6.6	5.7	12.8	6.6
30	6.0	.....	5.6	8.7	7.2	13.7	6.9	7.2	6.4	5.7	11.9	6.4
31	6.0	.....	12.8	.....	6.8	.....	6.8	8.7	.....	5.7	.....	6.4

NOTE.—No discharge Nov. 19.

Monthly discharge of Kauaula ditch near Lahaina, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	14.6	6.0	7.88	485	A.
February	15.5	5.6	7.45	414	A.
March	12.8	4.9	6.27	386	A.
April	18.2	4.6	11.2	666	A.
May	15.5	6.4	9.47	582	A.
June	18.2	5.6	7.61	453	A.
July	15.5	6.8	8.57	527	A.
August	15.5	6.8	8.29	510	A.
September	12.4	6.3	7.23	430	A.
October	14.2	5.6	7.27	447	A.
November[a]	16.4	4.6	11.7	696	A.
December	16.4	6.4	9.40	578	A.
The year	18.2	4.6	8.53	6,170	

[a] Ditch was dry Nov. 19. Mean is for 29 days.

LAUNIUPOKO STREAM NEAR LAHAINA, MAUI.

Location.—About 175 feet above Pioneer Mill Co.'s ditch intake, 1 mile above storage reservoir, and about 5½ miles southeast of Lahaina.

Records available.—July 25, 1911, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably shifting.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records poor.

Cooperation.—Station maintained in cooperation with Pioneer Mill Co.

Discharge measurements of Launiupoko Stream near Lahaina, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 17	0.84	6.05
Aug. 20	.45	.94

Monthly discharge of Launiupoko Stream near Lahaina, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	5.5	0.8	1.11	68.2	D.
February	3.9	.8	1.16	64.4	D.
March	1.4	.8	.83	51.0	D.
April	12	.8	2.86	170	D.
May	25	.8	2.99	184	D.
June	2.8	.8	1.02	60.7	D.
July	2.0	.8	.92	56.6	D.
August	5.5	.8	1.14	70.1	D.
September	1.5	.8	.82	48.8	D.
October	3.6	.8	1.06	65.2	D.
November	6.9	.8	2.12	126	D.
December	6.7	.8	1.08	66.4	D.
The year	25	.8	1.43	1,030	

OLOWALU STREAM NEAR OLOWALU, MAUI.

Location.—About 600 feet above Olowalu Sugar Co.'s power house, about 1 mile north of Olowalu.

Record available.—April 26 to December 31, 1913.

Gage.—Vertical staff.

Control.—Fairly permanent.

Discharge measurements.—Made from footbridge or by wading.

Diversions.—Water for power house diverted about 1½ miles above gage; measured in tailrace called Olowalu ditch No. 1.

Accuracy.—Records fair.

Cooperation.—Station maintained in cooperation with Olowalu Sugar Co.

Discharge measurements of Olowalu Stream near Olowalu, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 26	0.83	3.44	Aug. 20	0.50	0.10
May 15	1.77	55.8			

Daily discharge, in second-feet, of Olowalu Stream near Olowalu, Maui, for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		0.4	0.4	21		0.2			1.2
2		1.6	.3	11		.3			.4
3		.4	2.6	25				32	.3
4		.4	.4	11				18	84
5		.2	.2	1.9				6.3	34
6				7.6				.1	29
7		.2	.3	2.9					19
8			8.0	2.4				42	12
9			.3	1.9				102	10
10			4.0	1.9				60	7.6
11			.2	.3				35	6.6
12		46			28			29	5.6
13		37	7.0	18	.5		1.6	28	5.0
14		134	7.0		2.6		.1	15	5.6
15		86	2.6		7.3			2.7	.9
16		36	.4		11			.3	.2
17		24	.8		18			5.3	.1
18		21	.2		4.5	4.0		16	12
19		16	2.4		5.6			40	.3
20		13	.2		77			38	.2
21		11			13			7.6	.1
22		9.0			39		7.0	2.4	
23		5.3			1.1		1.1	.4	
24		7.0			.2		.2	1.9	
25		69			.2			28	
26	2.9	1.2			.2			50	
27	5.1		5.6		.2			18	
28	1.6	107	5.9		.2			7.0	
29	1.1	5.3	126		.2			2.3	
30	.6	1.8	11		.2			4.5	
31		.2			1.0				

NOTE.—No discharge for days for which figures are not given; water diverted above station at power house.

Monthly discharge of Olowalu Stream near Olowalu, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 27-30	5.1	0.6	2.26	22.4	C.
May	134	(a)	20.4	1,250	C.
June	126	(a)	6.19	368	C.
July	25	(a)	3.38	208	C.
August	77	(a)	6.77	416	C.
September	4.0	(a)	.15	8.9	C.
October	7.0	(a)	.32	19.7	C.
November	102	(a)	19.7	1,170	C.
December	84	(a)	7.55	464	C.
The period				3,930	

a Stream dry.

OLOWALU DITCH NO. 1 NEAR OLOWALU, MAUI.

Location.—One mile above Olowalu, near Olowalu plantation power house, and about 7 miles east of Lahaina.

Records available.—August 12, 1911, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made in flume.

Accuracy.—Records good.

Cooperation.—Station maintained in cooperation with Olowalu Sugar Co.

Discharge measurements of Olowalu ditch No. 1 near Olowalu, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 16	0.38	5.31
Aug. 20	.49	8.04

Daily discharge, in second-feet, of Olowalu ditch No. 1 near Olowalu, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.5	4.5	5.5	6.0	8.0	4.5	10	5.0	4.5	3.9	3.9	11
2	4.5	4.0	5.5	5.5	8.5	4.5	10	4.5	4.5	4.0	4.0	11
3	4.5	4.0	5.0	5.0	8.0	5.5	10	4.5	4.5	4.0	4.8	11
4	4.0	4.0	4.5	4.0	8.0	4.5	8.5	4.5	4.5	4.0	5.5	15
5	4.5	4.0	4.5	4.0	7.0	4.5	8.0	4.5	4.5	4.0	4.8	13
6	4.5	6.0	4.5	4.0	6.0	4.5	7.5	4.5	4.5	4.9	4.8	11
7	4.5	8.0	4.5	4.0	6.0	4.5	5.5	4.5	4.5	4.0	4.8	11
8	4.5	5.5	4.5	4.0	5.5	4.5	5.5	4.5	4.0	5.5	8.0	9.5
9	4.5	4.0	4.5	4.0	5.5	4.5	5.5	4.5	4.0	4.3	4.8	7.5
10	4.5	4.5	4.0	4.5	5.5	4.5	5.5	5.0	4.0	4.0	3.8	6.8
11	4.0	5.0	4.0	9.5	6.0	4.0	5.5	4.5	4.0	3.9	3.8	5.5
12	4.0	4.5	4.0	4.5	5.5	4.5	7.0	6.0	4.0	3.8	3.0	5.5
13	10	4.5	4.0	4.5	10	5.5	8.0	4.5	4.0	6.5	4.0	4.9
14	7.5	4.5	6.0	9.5	8.0	4.5	8.0	8.0	4.0	8.0	4.0	5.2
15	4.5	4.5	6.0	11	4.5	5.0	7.0	8.0	4.0	5.2	6.0	5.8
16	5.0	4.5	7.5	6.0	7.0	4.5	7.0	8.0	4.0	4.3	9.5	7.5
17	4.5	4.5	7.5	4.5	10	4.5	5.5	7.5	5.0	4.0	11	8.0
18	4.0	5.5	5.5	4.0	9.5	4.0	5.5	8.0	8.0	4.0	11	11
19	4.0	8.0	5.0	6.0	9.0	4.0	6.0	8.0	6.0	4.0	11	8.0
20	3.5	7.0	4.5	11	6.0	4.0	7.5	7.5	5.0	3.9	9.5	8.0
21	3.0	5.5	5.0	11	5.5	4.0	7.0	7.0	4.5	3.8	11	8.0
22	4.5	4.5	7.5	7.5	5.5	4.0	5.5	7.0	4.5	4.0	11	6.8
23	4.5	4.0	6.0	5.0	5.5	4.5	6.0	6.0	4.5	6.8	11	6.8
24	4.5	3.5	5.0	6.0	5.5	5.5	6.0	5.5	4.0	7.5	11	6.0
25	4.5	7.0	5.0	8.0	5.5	5.5	5.5	5.5	4.0	6.0	13	5.5
26	4.0	5.0	4.5	8.5	5.5	5.5	5.5	5.0	4.0	5.5	13	5.5
27	4.0	4.0	5.0	8.5	5.0	8.0	5.5	5.0	4.0	5.2	12	5.5
28	4.0	4.5	6.0	8.5	5.5	8.5	5.5	4.5	4.0	5.2	11	5.5
29	4.0	.....	4.5	8.0	5.5	9.5	5.0	4.5	4.0	5.2	11	5.5
30	4.0	.....	5.0	8.0	5.0	9.5	4.5	4.5	4.0	4.8	11	5.4
31	4.5	.....	8.0	.....	5.0	.....	4.5	7.0	.....	5.5	.....	5.2

Monthly discharge of Olowalu ditch No. 1 near Olowalu, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	10	3.0	4.55	280	B.
February	8.0	3.5	4.96	275	B.
March	8.0	4.0	5.24	322	B.
April	11	4.0	6.48	386	B.
May	10	4.5	6.53	402	B.
June	9.5	4.0	5.17	308	B.
July	10	4.5	6.56	403	B.
August	8.0	4.5	5.73	352	B.
September	8.0	4.0	4.43	264	B.
October	8.0	3.8	4.85	298	B.
November	13	3.0	7.90	470	B.
December	15	4.9	7.80	480	B.
The year	15	3.0	5.86	4,240	

WAIKAPU STREAM NEAR WAIKAPU, MAUI.

Location.—One and one-half miles west of Waikapu and about 5 miles southwest of Wailuku; 500 feet below intake of Palolo ditch.
Records available.—December 1, 1910, to December 31, 1913.
Gage.—Inclined staff.
Control.—Shifting.
Discharge measurements.—Made by wading.
Diversions.—Most of the normal flow diverted into the South Side Waikapu and the Palolo ditches.
Accuracy.—Records poor on account of insufficient rating.

The following discharge measurement was made by C. T. Bailey:
May 27, 1913: Gage height, 0.34 foot; discharge, 0.20 second-foot.

Monthly discharge of Waikapu Stream near Waikapu, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	0.3	0.2	0.20	12.3	D.
February	50	.2	4.70	261	D.
March	.3	.2	.21	12.9	D.
April	81	.2	10.3	613	D.
May	181	.2	8.94	550	D.
June	27	.2	1.60	95.0	D.
July	6.0	.2	.53	32.6	D.
August	25	.2	3.05	188	D.
September	.8	.2	.22	13.1	D.
October	1.0	.2	.25	15.4	D.
November	149	.2	9.30	553	D.
December	178	.2	13.6	836	D.
The year	181	.2	4.40	3,180	

SOUTH SIDE WAIKAPU DITCH NEAR WAIKAPU, MAUI.

Location.—One mile below ditch intake, 1½ miles west of Waikapu, and about 5½ miles southwest of Wailuku.
Records available.—November 21, 1910, to December 31, 1913.
Gage.—Vertical staff.
Control.—Fairly permanent.
Discharge measurements.—Made from plank over ditch about 400 feet below gage.
Accuracy.—Records good.

Discharge measurements of South Side Waikapu ditch near Waikapu, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 9	0.57	3.47	July 29	0.60	3.78
May 27	.73	6.29	Nov. 5	.66	4.86

Daily discharge, in second-feet, of South Side Waikapu ditch near Waikapu, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	2.8	4.8	4.2	5.7	6.0	9.0	4.2	6.0	3.4	2.9	6.0
2	4.1	2.8	4.2	4.1	8.8	6.0	9.4	4.8	6.0	3.4	3.1	6.0
3	4.5	2.8	4.2	3.9	6.8	6.2	7.5	4.2	5.7	3.1	10.4	5.6
4	3.9	2.8	4.1	3.6	7.0	6.0	6.7	4.2	5.4	3.4	9.0	14.5
5	3.5	2.8	3.9	3.5	7.6	6.0	5.7	4.2	5.4	3.1	5.4	8.5
6	3.1	10.1	3.9	3.5	8.2	6.0	5.9	4.1	5.0	3.6	4.2	6.0
7	3.1	5.9	4.2	3.5	8.5	5.9	6.7	3.9	5.7	3.2	3.8	4.5
8	2.9	11.0	4.2	3.5	8.3	6.3	5.7	3.8	4.2	4.4	17.3	4.2
9	2.8	7.1	3.9	3.5	8.5	6.0	5.1	3.9	4.2	3.4	15.7	.6
10	2.8	5.0	3.9	3.9	8.3	6.7	4.5	7.0	3.9	3.1	10.8	7.3
11	2.8	5.1	3.9	8.3	8.2	6.3	4.2	4.5	4.4	2.8	8.3	6.7
12	2.8	4.2	3.9	11.0	12.6	8.0	7.0	10.8	3.9	2.8	7.1	6.2
13	4.1	3.5	3.9	11.3	10.6	6.8	6.2	8.7	4.6	3.9	7.1	5.8
14	4.5	3.5	3.9	10.6	11.0	6.0	5.7	6.0	3.9	2.9	6.0	5.4
15	4.5	3.5	4.4	13.7	8.0	7.6	5.4	6.3	3.8	3.1	5.2	4.5
16	3.5	3.6	4.5	12.2	6.7	6.2	5.2	10.1	4.2	2.9	6.3	4.2
17	3.1	3.5	5.1	11.9	8.7	5.7	5.2	8.3	4.4	2.9	7.3	4.6
18	2.8	10.4	4.4	10.8	9.0	5.6	5.2	6.2	7.6	2.8	11.2	5.1
19	2.8	6.5	4.1	8.7	9.0	5.1	5.2	5.1	5.1	2.8	13.2	4.2
20	2.8	9.0	3.6	7.3	7.8	4.5	5.4	5.4	4.2	2.8	8.3	3.9
21	2.8	6.5	3.5	8.5	7.1	4.2	5.1	5.7	4.4	2.7	7.0	3.8
22	2.8	5.7	5.1	8.2	7.0	4.1	4.5	4.8	3.9	2.7	5.7	2.8
23	2.8	5.6	4.2	7.8	6.5	4.1	5.1	5.1	3.9	2.7	6.3	2.8
24	2.8	4.2	3.9	7.6	6.0	4.1	5.1	5.1	3.6	2.7	8.3	2.8
25	2.8	7.6	3.9	7.3	6.0	4.2	5.7	5.4	3.5	2.8	9.4	2.8
26	2.8	7.3	3.6	6.2	8.8	3.9	4.8	5.1	3.5	2.7	12.6	2.8
27	2.8	5.7	3.5	6.3	6.8	11.2	4.5	6.2	3.5	2.7	8.3	2.7
28	2.8	5.6	5.0	5.7	6.3	9.4	3.9	6.0	3.5	2.8	6.8	2.7
29	2.8	.....	4.1	5.7	6.0	8.8	3.9	5.4	3.4	3.0	5.7	2.7
30	2.8	.....	3.5	5.9	5.9	9.4	4.5	5.4	3.4	3.1	8.3	2.5
31	3.5	.....	5.0	.....	5.7	.....	4.2	9.9	.....	2.9	.....	2.5

Monthly discharge of South Side Waikapu ditch near Waikapu, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	4.5	2.8	3.21	197	A.
February	11.0	2.8	5.50	305	A.
March	5.1	3.	4.14	255	A.
April	13.7	3.5	7.07	421	A.
May	12.6	5.7	7.79	479	A.
June	11.2	3.9	6.21	370	A.
July	9.4	3.9	5.55	341	A.
August	10.8	3.8	5.80	357	A.
September	7.6	3.4	4.47	266	A.
October	4.4	2.7	3.05	187	A.
November	17.3	2.9	8.03	478	A.
December	14.5	.6	4.67	287	A.
The year	17.3	.6	5.45	3,940	

PALOLO DITCH NEAR WAIKAPU, MAUI.

Location.—Two hundred feet below ditch intake, 1½ miles west of Waikapu, and about 5½ miles southwest of Wailuku.

Records available.—November 21, 1910, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Accuracy.—Records good.

Discharge measurements of Palolo ditch near Waikapu, Maui, in 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 9	0.81	2.61	July 29	0.80	2.24
May 27	.84	2.83			

Daily discharge, in second-feet, of Palolo ditch near Waikapu, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.8	2.8	2.8	2.5	2.4	2.6	3.2	2.4	2.6	2.4	2.4	2.6
2	2.9	2.6	2.8	2.5	3.1	2.7	3.4	2.6	2.5	2.4	2.5	2.6
3	3.1	2.6	2.6	2.5	2.8	2.8	3.1	2.5	2.6	2.4	2.5	2.5
4	3.0	2.6	2.5	2.5	2.6	2.6	2.9	2.5	2.5	2.4	2.8	3.5
5	3.0	2.6	2.5	2.5	2.5	2.6	2.6	2.5	2.5	2.4	2.5	2.8
6	3.0	4.3	2.5	2.5	2.4	2.6	2.8	2.4	2.5	2.5	2.4	2.9
7	3.0	3.5	2.5	2.5	2.5	2.6	3.0	2.4	2.8	2.4	2.4	6.0
8	3.0	4.5	2.5	2.5	2.4	2.6	2.6	2.4	2.5	2.5	5.2	5.9
9	3.0	3.4	2.5	2.5	2.4	3.0	2.6	2.4	2.5	2.4	3.8	2.7
10	3.0	2.8	2.5	2.6	2.4	3.3	2.6	3.7	2.4	2.4	3.0	3.4
11	3.0	2.8	2.5	4.8	2.4	3.0	2.5	2.6	2.5	2.4	2.9	1.4
12	3.0	2.6	2.5	3.9	3.5	3.1	3.4	3.9	2.4	2.4	2.8	2.3
13	3.1	2.6	2.5	3.8	3.1	2.9	3.0	3.4	2.6	2.5	2.8	2.0
14	3.4	2.6	2.5	3.8	3.6	2.7	2.8	2.6	2.4	2.6	2.6	2.2
15	3.2	2.5	2.8	3.9	3.6	3.0	2.6	2.7	2.4	2.6	2.5	2.0
16	3.0	2.6	2.8	3.9	3.4	2.9	2.5	4.2	2.5	2.5	2.6	2.0
17	3.0	2.9	2.6	3.9	3.3	2.6	2.5	3.5	2.5	2.4	2.9	2.0
18	3.0	3.4	2.5	3.8	3.2	2.5	2.5	2.8	2.9	2.4	3.1	2.1
19	2.9	3.4	2.5	3.4	3.3	2.5	2.5	2.6	2.6	2.4	3.3	2.3
20	2.8	3.4	2.5	3.1	3.0	2.5	2.7	2.6	2.5	2.4	2.9	2.4
21	2.9	3.2	2.5	3.4	2.9	2.5	2.5	2.6	2.5	2.4	2.6	2.4
22	2.8	3.1	2.8	3.1	2.9	2.5	2.5	2.5	2.4	2.4	2.6	2.5
23	2.8	3.0	2.6	3.0	2.6	2.5	2.6	2.6	2.4	2.4	2.6	2.5
24	2.8	2.8	2.5	2.6	2.6	2.4	2.5	2.6	2.4	2.4	2.6	2.5
25	2.8	3.4	2.5	2.6	2.6	2.5	2.6	2.6	2.4	2.5	2.8	2.5
26	2.6	3.2	2.5	2.5	3.1	2.4	2.6	2.5	2.4	2.4	3.5	2.5
27	2.6	3.0	2.5	2.5	2.8	3.8	2.5	2.8	2.4	2.4	2.8	2.5
28	2.6	2.8	2.8	2.4	2.6	3.6	2.5	2.6	2.4	2.9	2.5	2.5
29	2.6	.....	2.5	2.4	2.5	3.3	2.5	2.5	2.4	3.3	2.5	2.6
30	2.6	.....	2.5	2.4	2.5	3.4	2.6	2.5	2.4	2.5	2.8	2.6
31	2.8	.....	2.5	.....	2.5	.....	2.5	4.0	.....	2.4	.....	2.6

Monthly discharge of Palolo ditch near Wailuku, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	3.4	2.6	2.91	179	A.
February	4.5	2.5	3.04	169	A.
March	2.8	2.5	2.57	158	A.
April	4.8	2.4	3.01	179	A.
May	3.6	2.4	2.81	173	A.
June	3.8	2.4	2.79	166	A.
July	3.4	2.5	2.70	166	A.
August	4.2	2.4	2.78	171	A.
September	2.9	2.4	2.49	148	A.
October	3.3	2.4	2.48	152	A.
November	5.2	2.4	2.87	171	A.
December	6.0	1.4	2.69	165	A.
The year	6.0	1.4	2.76	2,000	

HAIPUAENA STREAM NEAR HUELO, MAUI (OLD STATION).

Location.—About 7 miles by trail east of Huelo post office, about 400 feet below point where Spreckels ditch joins the stream.
Records available.—December 18, 1910, to September 30, 1913.
Gage.—Vertical staff.
Control.—Shifting.
Discharge measurements.—Made by wading.
Diversions.—Combined flow of stream and Spreckels ditch was measured.
Accuracy.—Poor.
Cooperation.—Station is maintained in cooperation with East Maui Ditch Co.

Monthly discharge of Haipuaena Stream near Huelo, Maui, for 1913.

[Old station.]

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	80	9.0	27.7	1,700	D.
February	100	8.5	20.6	1,140	D.
March	65	4.5	19.4	1,190	D.
April	136	14	46.8	2,780	D.
May	79	14	23.8	1,460	D.
June	72	10	24.6	1,460	D.
July	56	7.0	24.7	1,520	D.
August	96	5.5	25.2	1,550	D.
September	90	8.0	17.8	1,060	D.
The period				13,900	

HAIPUAENA STREAM NEAR HUELO, MAUI (NEW STATION).

Location.—Seven miles east of Huelo post office, 200 feet above Spreckels ditch inflow.
Records available.—October 19 to December 31, 1913.
Gage.—Friez water-stage recorder.
Control.—Probably permanent.
Discharge measurements.—Made from footbridge or by wading.
Diversions.—None above station.
Accuracy.—Records very good.

Discharge measurements of Haipueno Stream near Huelo, Maui, in 1913.

[New station.]

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 27	E. O. Christiansen.	0.42	2.77	Nov. 12	C. T. Bailey	2.10	81.0
Nov. 4	do	1.38	33.6	Nov. 13	do	1.01	14.9
Nov. 8	do	2.46	141	Nov. 18	do	2.72	161

Daily discharge, in second-feet, of Haipuaena Stream near Huelo, Maui, for 1913.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	4	7	11	.....	28	8	21	4	39	7
2	.....	15	7	12	.....	58	8	22	4	27	6
3	.....	71	11	13	.....	19	14	23	3	15	6
4	.....	32	174	14	.....	11	37	24	3	83	5
5	.....	10	85	15	.....	14	23	25	3	31	5
6	.....	7	61	16	.....	28	12	26	3	42	5
7	.....	14	17	17	.....	41	18	27	3	21	4
8	.....	100	20	18	.....	138	33	28	3	12	4
9	.....	150	13	19	4	136	11	29	3	10	4
10	.....	62	9	20	4	52	8	30	3	8	4
								31	3	.....	4

NOTE.—Discharge interpolated Nov. 16 and 22.

Monthly discharge of Haipuaena Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
October 19–31	4	3	3.3	85	A.
November	150	4	42.6	2,530	A.
December	174	4	20.3	1,250	A.

PUOHAKAMOA STREAM NEAR HUELO, MAUI (OLD STATION).

Location.—About 6 miles by trail east of Huelo post office, immediately below point where Spreckels ditch falls into stream.

Records available.—December 18, 1910, to June 18, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversions.—Measurement made of combined flow of stream and Spreckels ditch.

Accuracy.—Records poor.

Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

Monthly discharge of Puohakamoa Stream near Huelo, Maui, for 1913.

[Old station.]

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	106	16	38.7	2,380	D
February	169	15	35.0	1,940	D.
March	489	6	39.1	2,400	D
April	209	20	77.7	4,620	D
May	177	18	36.9	2,270	D.
June 1–18	100	18	34.3	1,220	D.
The period	.....	.....	.....	14,800	

PUOHAKAMOA STREAM NEAR HUELO, MAUI (NEW STATION).

Location.—Seven miles east of Huelo post office, 150 feet above Spreckels ditch trail.
Records available.—June 13 to December 31, 1913.
Gage.—Barrett & Lawrence water-stage recorder.
Control.—Fairly permanent.
Discharge measurements.—Made from trail bridge or by wading.
Diversions.—Kula pipe line diverts water at an elevation of 4,300 feet.
Accuracy.—Low-water records good; records for high stages only approximate.

Discharge measurements of Puohakamoa Stream near Huelo, Maui, in 1913.

[New station.]

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 19	C. T. Bailey	1.26	[a] 7.70	Nov. 12	C. T. Bailey	3.18	130
Oct. 27	E. O. Christiansen	.94	[a] 6.49	Nov. 13	do	2.40	37.6

[a] Discharge is the difference between measured discharge of Spreckels ditch above and below Puohakamoa Stream.

Daily discharge, in second-feet, of Puohakamoa Stream near Huelo, Maui, for 1913.

[New station.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	11	6.2	.....	6.5	6.6	14
2	.....	43	6.2	.....	6.0	15	12
3	.....	21	6.1	.....	5.8	128	16
4	.....	20	5.8	.....	6.2	68	366
5	.....	36	5.8	.....	6.2	16	178
6	.....	52	7.1	.....	15	11	147
7	.....	21	40	.....	27	13	55
8	.....	16	8.4	.....	37	226	61
9	.....	12	7.4	.....	12	305	34
10	.....	10	7.4	.....	8.5	153	21
11	.....	10	74	.....	8.2	79	17
12	.....	11	76	.....	7.6	129	16
13	53	11	17	.....	17	47	15
14	24	11	15	.....	11	22	79
15	16	10	15	.....	9.1	20	62
16	10	9.0	12	.....	8.0	66	26
17	8.7	8.7	9.7	13	7.4	100	37
18	8.1	8.0	8.6	24	7.2	267	91
19	7.8	7.6	8.1	22	7.0	233	23
20	7.4	7.8	7.8	10	6.8	92	17
21	7.1	8.1	7.6	8.7	6.9	68	14
22	7.0	7.4	7.2	7.8	6.6	28	13
23	7.0	7.2	7.0	7.4	6.4	31	12
24	7.0	7.2	7.0	7.0	6.3	173	11
25	7.0	7.2	6.8	6.7	6.2	91	10
26	7.0	7.2	6.8	6.5	6.2	114	9.7
27	7.0	7.2	6.9	6.5	6.2	57	9.3
28	7.0	7.0	7.3	6.5	6.2	26	8.9
29	7 0	6.8	7.0	6.4	6.1	21	8.7
30	9.5	6.6	16	6.1	6.0	16	8.1
31	.....	6.5	8.8	.....	6.0	.....	7.8

NOTE.—No record Sept. 1-16; recording instrument out of order.

Monthly discharge of Puohakamoa Stream near Huelo, Maui, for 1913.

[New station.]

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 13-30	53	7.0	11.5	410	A.
July	52	6.5	13.4	824	A.
August	76	5.8	13.9	855	A.
September 17-30	24	6.1	9.90	275	A.
October	37	5.8	9.31	572	A.
November	305	6.6	87.4	5,200	C.
December	366	7.8	45.1	2,770	B.
The period				10,900	

ALO STREAM NEAR HUELO, MAUI.

Location.—About 5 miles by trail east of Huelo post office, immediately below bridge where old Spreckels ditch trail crosses stream.

Records available.—December 18, 1910, to December 31, 1913.

Gage.—Vertical staff.

Control.—Affected by backwater from inflow of Spreckels ditch.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records poor.

Discharge measurements of Alo Stream near Huelo, Maui, for 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
July 24	1.48	1.45	Nov. 20	2.11	18.2
Nov. 18	2.58	31.9			

Monthly discharge of Alo Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	24	1.1	4.80	295	D.
February	61	.8	4.72	262	D.
March	7.8	.5	2.65	164	D.
April	51	1.7	11.7	696	D.
May	28	1.2	3.56	219	D.
June	9.4	1.2	3.33	198	D.
July	21	.7	3.75	231	D.
August	43	.5	4.30	264	D.
September	11	.7	2.04	121	D.
October	15	.4	2.73	168	D.
November	97	.7	22.8	1,360	D.
December	110	1.2	10.7	658	D.
The year	110	.4	6.40	4,640	

WAIKAMOI STREAM NEAR HUELO, MAUI.

Location.—Five hundred feet above Spreckels ditch intake and 5 miles east of Huelo post office.

Records available.—December 18, 1910, to December 31, 1913.

Gage.—Friez water-stage recorder installed October 14, 1913, at new datum; staff gage December 18, 1910, to October 13, 1913.

Control.—Probably permanent.

Discharge measurements.—Made from footbridge or by wading.

Diversions.—None above station.

Accuracy.—Records good.

Discharge measurements of Waikamoi Stream near Huelo, Maui, for 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 24	C. T. Bailey	1.40	3.23	Nov. 8	E. O. Christiansen	1.80	103
Oct. 27[a]	E. O. Christiansen,	.35	2.15	Nov. 13	C. T. Bailey	1.03	26.2
Nov. 4	do	1.49	83.9	Nov. 2	do	1.21	53.4

[a] Water-stage recorder installed at new datum Oct. 14, 1913.

Daily discharge, in second-feet, of Waikamoi Stream near Huelo, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10	4.0	2.6	21	6.8	5.5	25	2.2	5.7	.....	2.8	11
2	8.4	3.8	2.4	14	6.0	4.7	40	1.9	4.7	.....	12	9.4
3	7.8	3.0	2.2	8.4	7.4	4.7	14	2.0	4.4	.....	163	12
4	7.0	2.8	2.0	6.8	6.8	3.0	15	1.6	3.3	.....	67	388
5	6.2	3.6	1.8	6.4	6.4	6.0	18	1.4	2.8	.....	16	170
6	5.7	23	2.0	5.7	5.0	4.7	21	2.7	2.4	.....	12	143
7	5.0	9.2	3.3	5.0	5.0	4.6	10	4.6	2.7	.....	.....	24
8	8.8	6.0	2.6	4.4	7.8	4.4	9.2	9.6	2.6	.....	.....	29
9	9.0	4.1	4.1	6.0	5.4	5.2	7.4	5.4	2.6	.....	250	18
10	11	3.6	2.8	4.7	4.7	9.6	6.4	7.6	2.4	.....	106	13
11	6.4	3.0	1.9	48	4.1	6.6	6.0	5.8	2.0	.....	36	11
12	7.8	2.7	1.0	60	5.7	15	7.0	42	3.3	.....	104	10
13	22	2.4	.9	92	7.8	15	11	16	3.0	.....	30	9.4
14	18	2.4	.8	43	6.8	14	8.8	14	3.3	.....	18	52
15	21	2.2	.8	70	13	12	6.8	31	3.0	7.6	19	36
16	14	5.7	5.0	54	12	3.0	5.7	11	3.6	6.2	143	18
17	10	3.6	8.0	71	10	6.2	4.9	9.2	7.8	5.2	108	24
18	8.4	18	5.0	33	9.4	5.4	4.3	7.6	37	4.0	188	52
19	7.6	24	5.0	20	9.6	5.0	3.8	5.8	17	4.2	163	16
20	6.4	9.2	3.6	15	8.4	4.4	3.6	6.2	10	3.8	58	14
21	4.0	8.0	13	16	6.0	3.8	5.7	5.7	7.2	4.0	35	12
22	6.0	7.2	14	13	5.0	3.6	3.6	4.6	5.4	3.2	20	10
23	11	6.0	7.4	17	5.0	3.3	3.3	3.8	4.1	2.8	22	9.4
24	4.9	4.9	5.7	17	6.0	3.1	3.6	3.8	2.3	2.7	186	8.5
25	4.7	4.4	7.6	20	4.6	5.4	3.3	3.1	1.4	2.5	55	7.9
26	4.4	3.8	5.8	12	13	5.4	3.6	3.3	1.2	2.7	64	7.3
27	4.1	3.3	4.9	12	7.6	8.8	3.3	6.4	1.2	2.7	35	6.8
28	3.8	2.9	11	9.6	7.2	12	2.9	5.5	1.4	2.7	21	6.4
29	3.3	.....	5.8	9.0	7.6	8.2	2.6	3.8	1.2	2.3	17	6.0
30	3.1	.....	28	7.2	6.4	18	2.5	3.0	.9	2.0	12	5.6
31	3.3	.....	47	.....	8.4	.....	2.4	6.8	.....	2.1	.....	5.4

NOTE.—No record Oct. 1–14 and Nov. 7–8.

Monthly discharge of Waikamoi Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	22	3.1	8.16	502	B.
February	24	2.2	6.31	350	B.
March	47	.8	6.71	413	B.
April	92	4.4	24.0	1,430	B.
May	13	4.1	7.25	446	B.
June	18	3.0	7.01	417	B.
July	40	2.4	8.54	525	B.
August	42	1.4	7.66	471	B.
September	37	.9	5.00	298	B.
October 15–31	7.6	2.0	3.57	110	B.
November 1–6, 9–30	250	2.8	70.1	3,890	A.
December	388	5.4	36.9	2,270	A.
The period				11,100	

OOPUOLA STREAM NEAR HUELO, MAUI.

Location.—About 2 miles by trail east of Huelo post office, about 400 feet above old Spreckels ditch crossing.

Records available.—December 16, 1910, to December 31, 1913.

Gage.—Vertical staff.

Control.—Fairly permanent.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records poor on account of only one reading daily.

Discharge measurements of Oopuola Stream near Huelo, Maui, for 1913.

[C. T. Bailey, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 19	1.01	0.64
Nov. 12	2.29	24.0

Daily discharge, in second-feet, of Oopuola Stream near Huelo, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.4	0.8	0.8	16	1.6	0.8	17	0.6	0.7	0.7	0.7	4.8
2	5.0	.8	.8	15	1.2	.8	21	.6	.7	.7	1.9	2.0
3	4.8	.8	.8	1.2	1.3	.8	12	.6	.7	.7	3.2	12
4	3.4	.7	.8	8.1	1.2	1.3	2.2	.6	.7	.7	11	15
5	2.2	.6	.8	6.4	1.1	.8	2.0	.6	.7	1.4	3.4	32
6	.9	35	.8	3.6	1.1	.8	1.8	.7	.7	2.2	2.4	60
7	.8	2.9	.8	.9	.9	.8	2.0	3.9	.7	2.9	.8	32
8	12	10	.8	.9	.8	1.2	1.8	1.2	.7	27	67	4.4
9	8.1	5.4	.8	1.0	.8	1.7	1.6	1.0	.7	2.0	42	4.1
10	12	.8	.8	.8	.9	2.2	1.2	.9	.7	.8	18	3.6
11	12	1.1	.8	80	1.1	1.2	1.1	.8	.7	.8	25	2.7
12	41	.9	.8	18	1.2	3.1	.9	6.4	.7	1.6	27	3.9
13	70	.9	.8	18	1.0	15	1.0	6.4	.7	2.4	15	2.6
14	30	.9	.8	18	1.0	1.4	1.2	6.7	.7	15	10	9.3
15	34	.9	.8	21	11	1.2	1.1	34	.7	1.6	8.5	16
16	3.9	2.4	1.6	30	6.4	1.0	1.0	5.3	1.2	1.1	9.2	18
17	2.0	3.8	2.3	34	5.3	.9	.8	3.4	1.2	1.0	10	19
18	5.0	12	2.0	24	4.0	.8	.8	1.4	11	.8	67	21
19	8.5	21	1.1	22	2.7	.8	.8	1.2	4.4	.7	12	4.4
20	12	12	.9	23	1.4	.8	.8	.9	1.2	.7	9.0	3.4
21	10	2.0	2.4	24	1.2	.8	.9	.9	1.0	.7	18	2.6
22	1.4	1.4	16	44	1.1	.8	.7	.8	.8	.7	11	1.9
23	1.2	3.9	8.4	16	1.0	.8	.7	.8	.7	.7	14	1.8
24	1.1	6.4	.9	23	1.6	.8	.7	.8	.7	.7	16	1.8
25	.8	.8	1.2	30	9.8	.8	.7	.7	.7	.7	12	1.5
26	.8	.8	1.1	27	18	.9	.7	.7	.7	.7	12	1.2
27	.9	.8	.9	16	10	2.9	.7	2.9	.7	.7	14	1.2
28	.8	.8	2.5	4.4	.9	21	.7	.8	.7	.7	14	1.1
29	.8	.....	.9	3.9	.8	21	.7	.8	.7	.7	11	1.0
30	.8	.....	.8	2.9	.8	21	.7	.7	.7	.7	7.9	.9
31	.8	.....	.7	.....	.8	.....	.7	.8	.....	.7	.....	.9

NOTE.—Discharge estimated for days (usually Sundays) on which no gage heights were recorded.

Monthly discharge of Oopuola Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	70	0.8	9.37	576	D.
February	35	.6	4.60	259	D.
March	16	.7	1.80	111	D.
April	80	.8	17.8	1,060	D.
May	18	.8	2.97	183	D.
June	21	.8	3.61	215	D.
July	21	.7	2.58	159	D.
August	34	.6	2.84	175	D.
September	11	.7	1.23	73	D.
October	27	.7	2.34	144	D.
November	67	.7	15.8	937	D.
December	60	.9	9.24	567	D.
The year	80	.6	6.15	4,460	

SPRECKELS DITCH AT GAGE NO. 1, NEAR HUELO, MAUI.

Location.—About 8½ miles by trail east of Huelo, about 20 feet above bridge which crosses ditch in Ulawina Gulch.
Records available.—December 18, 1910, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made by wading.
Accuracy.—Records good.
Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

The following discharge measurement was made by C. T. Bailey:
June 19, 1913: Gage height, 0.40 foot; discharge, 5.94 second-feet.

Monthly discharge of Spreckels ditch at gage No. 1, near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	40	4.1	13.4	824	B.
February	42	3.6	0.1	561	B.
March	36	1.6	29.90	609	B.
April	48	6.0	5.8	1,540	B.
May	28	5.5	10.1	621	B.
June	33	5.1	11.0	655	B.
July	44	3.4	13.5	830	B.
August	46	2.4	12.0	738	B.
September	40	3.7	8.05	479	B.
The period				6,860	

SPRECKELS DITCH AT GAGE NO. 2, NEAR HUELO, MAUI.

Location.—About 7½ miles by trail east of Huelo post office and 100 feet above junction of ditch with Kolea Stream No. 2.
Records available.—November 6, 1911, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from log across ditch near gage.
Accuracy.—Records good.
Cooperation.—Station is maintained in cooperation with East Maui Ditch Co.

The following discharge measurement was made by C. T. Bailey:
June 19, 1913: Gage height, 0.90 foot; discharge, 6.84 second-feet.

Monthly discharge of Spreckels ditch at gage No. 2, near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	36	4	13.1	806	B.
February	36	3	8.9	494	B.
March	38	2	9.3	572	B.
April	38	5	22.6	1,340	B.
May	36	5	10.8	664	B.
June	38	4	12.9	768	B.
July	35	3	12.5	769	B.
August	35	2	12.4	762	B.
September	35	3	7.5	446	B.
The period				6,620	

SPRECKELS DITCH AT GAGE NO. 3, NEAR HUELO, MAUI.

Location.—About 6¾ miles by trail east of Huelo and 400 feet above junction of ditch with Haipuaena Stream.
Records available.—December 18, 1910, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from log near gage.
Accuracy.—Records good.
Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

The following discharge measurement was made by C. T. Bailey:
June 19, 1913: Gage height, 1.20 feet; discharge, 9.33 second-feet.

Monthly discharge of Spreckels ditch at gage No. 3, near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	40	7.4	18.3	1,120	B.
February	39	6.0	12.9	716	B.
March	41	3.6	13.5	830	B.
April	45	8.7	27.4	1,630	B.
May	40	7.9	15.7	965	B.
June	40	5.8	16.2	964	B.
July	38	5.8	17.0	1,050	B.
August	39	4.6	15.7	965	B.
September	38	6.0	11.5	684	B.
The period				8,920	

SPRECKELS DITCH AT GAGE NO. 4, NEAR HUELO, MAUI.

Location.—About 6¼ miles by trail east of Huelo and about 250 feet above junction with small tributary of Puohakamoa Stream.
Records available.—December 18, 1910, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from log at gage.
Accuracy.—Records fair.
Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

The following discharge measurement was made by C. T. Bailey:
June 19, 1913: Gage height, 0.90 foot; discharge, 12.2 second-feet.

Monthly discharge of Spreckels ditch at gage No. 4, near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	38	9.5	21.2	1,300	C.
February	36	7.5	15.2	844	C.
March	40	4.0	14.6	898	C.
April	44	11.5	27.8	1,650	C.
May	38	9.5	18.3	1,130	C.
June	38	9.5	18.3	1,090	C.
July	36	5.5	19.0	1,170	C.
August	40	4.5	17.3	1,060	C.
September	38	7.0	13.7	815	C.
The period				10,000	

SPRECKELS DITCH AT GAGE NO. 5, NEAR HUELO, MAUI.

Location.—About 5 miles east of Huelo and about 500 feet above drop into Alo Stream.
Records available.—November 6, 1911, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from plank at gage.
Accuracy.—Records good.
Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

The following discharge measurement was made by C. T. Bailey:
June 4, 1913: Gage height, 1.10 feet; discharge, 21.6 second-feet.

Monthly discharge of Spreckels ditch at gage No. 5, near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	55	16	33.7	2,070	B.
February	54	13	24.6	1,370	B.
March	53	9	24.3	1,490	B.
April	58	19	43.4	2,580	B.
May	51	18	30.3	1,860	B.
June	55	16	28.2	1,680	B.
July	56	13	31.5	1,940	B.
August	66	16	30.4	1,870	B.
September	55	14	21.7	1,290	B.
The period				16,200	

SPRECKELS DITCH AT GAGE NO. 6, NEAR HUELO, MAUI.

Location.—About 3½ miles east of Huelo and 100 feet below Kolea Stream intake.
Records available.—November 4, 1911, to June 30, 1913.
Gage.—Vertical staff.
Discharge measurements.—Made from log at gage.
Control.—Probably permanent.
Accuracy.—Records good.
Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

The following discharge measurement was made by C. T. Bailey:
June 14, 1913: Gage height, 1.35 feet; discharge, 44.5 second-feet.

Monthly discharge of Spreckels ditch at gage No. 6, near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	52	30	33.4	2,050	B.
February	46	24	30.6	1,700	B.
March	42	18	31.8	1,960	B.
April	99	34	45.5	2,710	B.
May	50	31	42.4	2,610	B.
June	50	27	39.7	2,360	B.
The period				13,400	

SPRECKELS DITCH AT GAGE NO. 8, NEAR HUELO, MAUI.

Location.—About 1 mile by trail east of Huelo and 250 feet above gate to storage reservoir.
Records available.—November 4, 1911, to September 30, 1913.
Gage.—Vertical staff.
Control.—Probably permanent.
Discharge measurements.—Made from plank.
Accuracy.—Records fair. Discharge estimated for Sundays, when no gage record was obtained.
Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

The following discharge measurement was made by C. T. Bailey:
June 4, 1913: Gage height, 2.10 feet; discharge, 45.1 second-feet.

Monthly discharge of Spreckels ditch at gage No. 8, near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	62	5.2	17.5	1,080	C.
February	54	1.9	22.9	1,270	C.
March	54	16	34.1	2,100	C.
April	68	22	51.3	3,050	C.
May	62	33	45.4	2,790	C.
June	58	32	43.9	2,610	C.
July	59	13	40.6	2,500	C.
August	67	17	38.1	2,340	C.
September	54	22	29.8	1,770	C.
The period				19,500	

NAILIILIHAELE STREAM NEAR HUELO, MAUI.

Location.—About 300 feet above New Hamakua ditch, 3 miles south of Huelo post office.
Records available.—December 9, 1910, to December 31, 1912; October 8 to December 31, 1913.
Gage.—Barrett & Lawrence water stage recorder.
Control.—Probably permanent.
Discharge measurements.—Made from footbridge.
Diversions.—None above station.
Accuracy.—Records good.

Discharge measurements of Nailiilihaele Stream near Huelo, Maui, in 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 2	E. O. Christiansen	0.86	6.89	Nov. 13	C. T. Bailey	1.70	67.5
9	do	1.17	26.6	18	do	2.38	174
Nov. 3	do	1.58	52.9	19	do	3.30	514

Daily discharge, in second-feet, of Nailiilihaele Stream near Huelo, Maui, for 1913.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	3.6	32	16	14	45	46
2	.....	13	37	17	12	67	63
3	.....	158	65	18	8.5	225	110
4	.....	104	674	19	8.0	275	49
5	.....	35	245	20	8.0	122	40
6	.....	28	160	21	8.0	91	34
7	.....	27	71	22	8.0	48	31
8	156	290	91	23	7.4	38	27
9	32	365	62	24	6.8	103	25
10	15	251	48	25	6.5	106	23
11	14	111	41	26	5.3	140	18
12	12	160	37	27	5.0	86	13
13	49	91	33	28	5.0	52	13
14	42	44	144	29	3.6	44	12
15	18	37	71	30	3.6	36	12
				31	3.6	.....	11

Monthly discharge of Nailiilihaele Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
October 8–31	156	3.6	18.8	895	A.
November	365	3.6	106	6,310	A.
December	674	11.0	75.4	4,640	A.

KAILUA STREAM NEAR HUELO, MAUI.

Location.—One mile south of Huelo post office and 800 feet above Spreckels ditch, at 1,250 feet elevation.

Records available.—December 8, 1910, to December 31, 1912; June 17 to December 31, 1913.

Gage.—Barrett & Lawrence water-stage recorder October 1 to December 31; vertical staff June 17 to September 30.

Control.—Probably permanent.

Discharge measurements.—Made from footbridge or by wading.

Diversions.—Old Hamakua ditch formerly diverted water above station, but that section of ditch is not used at present time.

Accuracy.—Records good October 1 to December 31; poor remainder of period on account of uncertainty of gage heights.

Discharge measurements of Kailua Stream near Huelo, Maui, in 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 16	C. T. Bailey	1.38	8.51	Nov. 3	E. O. Christiansen	2.60	73.8
Aug. 26	E. O. Christiansen	1.23	4.37	13	C. T. Bailey	2.03	37.4
Oct. 2	do	1.14	2.96	18	do	3.42	188
9	do	1.53	19.4	19	do	3.90	270

97764°—WSP 373—15——10

Daily discharge, in second-feet, of Kailua Stream near Huelo, Maui, for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	45	11	6.2	.....	4.0	21
2	.....	149	3.3	5.3	.....	30	20
3	.....	28	2.9	5.3	.....	136	22
4	.....	47	2.9	4.9	.....	65	443
5	.....	32	2.9	4.0	.....	22	262
6	.....	42	4.0	3.6	.....	16	104
7	.....	20	42	6.2	.....	31	56
8	.....	11	12	3.5	61	216	45
9	.....	7.5	6.2	3.6	13	384	26
10	.....	8.8	6.2	3.6	6.2	186	17
11	.....	8.8	4.9	3.3	5.5	70	13
12	.....	9.4	212	3.3	5.3	112	12
13	.....	17	26	3.6	12	41	11
14	.....	14	19	3.6	8.8	22	61
15	.....	8.8	91	3.6	8.0	19	69
16	.....	7.5	19	4.9	7.8	46	28
17	7.5	6.2	10	10	7.2	106	28
18	6.7	5.8	7.5	111	4.0	314	81
19	6.0	5.8	7.2	24	4.0	290	28
20	5.8	5.8	6.7	9.4	4.0	79	20
21	5.1	5.3	6.7	6.7	3.3	56	18
22	5.1	4.9	6.2	5.3	2.9	30	16
23	4.4	4.7	5.8	4.7	2.9	25	14
24	4.0	4.7	6.0	4.4	2.9	174	13
25	6.0	4.4	5.3	4.4	2.9	88	12
26	6.7	4.9	5.3	3.8	2.7	100	11
27	15	4.4	8.3	3.6	2.7	42	11
28	12	4.0	6.7	3.6	3.3	33	10
29	6.7	4.0	5.1	3.6	3.5	28	12
30	38	3.6	4.4	3.5	3.8	25	11
31	.....	3.5	24	.....	4.0	.....	11

NOTE.—No record Oct. 1–7.

Monthly discharge of Kailua Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 17–30	38	4.0	9.21	256	B
July	149	3.5	17.0	1,040	D.
August	212	2.9	18.7	1,150	D.
September	111	3.3	7.57	528	D.
October 8–31	61	2.7	5.86	360	A.
November	384	4.0	93.0	5,530	A.
December	443	10.0	48.6	2,990	A.
The period	.....	.....	.....	11,900	

NOTE.—Water-stage recorder installed October 1.

OANUI STREAM NEAR HUELO, MAUI.

Location.—At New Hamakua ditch crossing, 1 mile south of Huelo post office.

Records available.—December 7, 1910, to December 31, 1911; June 17 to December 31, 1913.

Gage.—Vertical staff in two sections.

Control.—Upper side of New Hamakua ditch forms permanent control.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records fair.

Monthly discharge of Oanui Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 17-30	10	3.5	4.46	124	C.
July	15	3.5	4.98	306	C.
August	22	3.5	5.00	307	C.
September	8	3.5	3.75	223	C.
October	11	3.5	3.95	243	C.
November	42	3.5	12.4	738	C.
December	72	3.5	9.87	607	C.
The period				2,550	

HOOLAWANUI STREAM NEAR HUELO, MAUI.

Location.—One-fourth mile east of Lupi and about 5 miles by trail from Huelo; 300 feet above crossing of New Hamakua ditch.

Records available.—December 12, 1910, to December 31, 1913.

Gage.—Vertical staff; datum lowered 0.20 foot June 6, 1913.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records fair.

Cooperation.—Station is maintained in cooperation with East Maui Ditch Co.

Discharge measurements of Hoolawanui Stream near Huelo, Maui, in 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 5	C. T. Bailey	0.30	2.84	Oct. 2	E. O. Christiansen	0.24	1.79
Aug. 27	do	.34	4.68	Nov. 19	C. T. Bailey	1.02	62.8

Daily discharge, in second-feet, of Hoolawanui Stream near Huelo, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12	4	4	15	9	2.0	13	2.3	2.6	1.9	1.9	11
2	9	4	3	8	8	3.0	32	2.3	2.6	1.9	2.1	9.2
3	8	3	3	6	8	2.0	10	2.5	2.6	4.0	15	13
4	7	3	3	5	7	6.0	11	2.3	2.5	2.3	17	112
5	6	3	3	5	6	3.0	9.2	2.3	2.3	1.9	5	82
6	6	88	3	5	6	3.0	12	2.6	2.3	2.5	5.0	62
7	5	7	3	4	5	3.0	9.2	5.0	2.6	2.6	4.0	35
8	10	5	3	4	5	2.6	8.0	2.6	2.3	19	46	36
9	10	4	4	4	5	2.8	7.0	2.3	2.3	4.0	94	24
10	10	4	3	4	4	4.0	6.5	2.5	2.3	3.0	62	16
11	7	3	3	40	4	2.6	6.0	2.3	2.3	2.6	48	15
12	7	3	3	20	4	18	6.0	33	2.3	2.5	56	14
13	52	3	2	71	4	10	6.5	7.5	2.3	7.0	24	13
14	44	3	2	50	5	8.0	6.5	5.5	2.3	3.5	17	40
15	71	3	2	88	8	6.0	6.0	30	2.1	2.6	15	22
16	13	4	8	82	6	5.0	5.0	9.2	2.3	2.6	16	17
17	12	3	6	96	7	4.0	4.5	8.6	3.5	2.6	16	19
18	10	11	6	48	5	3.0	4.0	6.5	9.2	2.5	66	39
19	10	48	4	30	5	3.0	4.0	5.0	5.0	2.3	82	17
20	9	8	4	27	4	3.0	3.5	5.0	2.6	2.3	38	13
21	8	7	5	30	3	3.0	3.0	5.0	2.6	2.3	29	12
22	7	6	10	17	3	3.0	3.0	4.0	2.3	2.3	23	10
23	6	5	5	16	3	3.0	3.0	3.5	2.3	2.1	17	9.2
24	5	5	4	16	3	2.8	2.8	3.0	2.3	2.1	44	8.0
25	5	4	5	29	3	3.0	2.6	3.0	2.1	2.1	33	8.0
26	4	4	3	15	6	4.0	2.6	3.0	2.1	2.1	36	7.0
27	4	4	3	22	4	9.2	2.6	3.5	2.1	2.1	28	6.5
28	4	4	5	14	3	6.0	2.6	3.0	2.1	2.1	20	6.0
29	4	.....	4	14	3	4.0	2.5	2.8	2.1	2.1	17	6.0
30	5	.....	4	11	3	7.0	2.5	2.6	2.1	1.9	13	5.0
31	4	.....	16	.....	3	.....	2.5	3.0	.....	1.9	.....	5.0

Monthly discharge of Hoolawanui Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	71	4.0	12.1	744	C.
February	88	3.0	9.04	502	C.
March	16	2.0	4.39	270	B.
April	96	4.0	26.5	1,580	B.
May	9.0	3.0	4.90	301	B.
June	18	2.0	4.63	276	B.
July	32	2.5	6.44	396	B.
August	33	2.3	5.67	349	C.
September	9.2	2.1	2.68	159	B.
October	19	1.9	3.12	192	B.
November	94	1.9	29.7	1,770	B.
December	112	5.0	22.3	1,370	B.
The year	112	1.9	10.9	7,910	

HOOLAWALIILII STREAM NEAR HUELO, MAUI.

Location.—About 400 feet above New Hamakua ditch crossing, 1½ miles east of Lupi, and about 4 miles above Huelo post office.

Records available.—April 5, 1911, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records good.

Discharge measurements of Hoolawaliilii Stream near Huelo, Maui, in 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 6	C. T. Bailey	0.14	3.12	Oct. 2	E. O. Christiansen	0.11	2.30
Aug. 27	E. O. Christiansen	.16	3.66	Nov. 19	C. T. Bailey	.51	31.2

Daily discharge, in second-feet, of Hoolawaliilii Stream near Huelo, Maui, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.0	2.2	1.8	8.2	4.1	1.4	8.2	2.6	3.0	2.2	2.2	8.2
2	5.7	2.2	1.6	3.4	3.8	1.3	16	2.6	3.0	2.2	2.2	7.6
3	4.9	2.2	1.6	2.6	3.8	1.3	8.2	2.6	3.4	4.5	4.9	8.2
4	4.1	1.8	1.6	2.6	3.4	2.2	8.2	2.6	3.0	2.6	5.7	41
5	3.4	2.6	1.6	2.6	3.4	1.4	8.2	2.2	2.6	2.6	4.1	39
6	3.4	36	1.8	2.2	3.4	1.4	9.5	2.6	2.6	3.0	3.4	36
7	3.0	24	1.6	2.2	3.0	1.4	7.0	4.5	3.0	3.4	3.0	26
8	5.7	3.4	2.2	1.8	2.6	1.4	5.7	2.6	3.0	9.5	21	24
9	5.7	3.4	1.6	2.6	2.6	1.4	5.7	2.6	3.4	4.1	30	16
10	5.7	2.6	1.4	1.8	2.2	1.8	4.9	3.0	2.6	3.4	23	11
11	4.9	2.6	1.4	32	1.8	1.4	4.9	2.6	2.6	2.6	21	8.8
12	4.1	2.2	1.4	10	1.8	4.5	4.1	23	2.6	2.6	37	8.8
13	26	2.2	1.4	34	1.8	5.7	4.9	5.7	3.0	7.0	19	8.2
14	28	2.2	1.4	22	2.2	5.3	4.5	4.9	2.6	3.8	14	16
15	28	2.2	1.4	37	3.0	4.9	4.1	11	2.6	3.4	11	11
16	22	2.2	4.5	34	2.6	3.4	4.1	7.0	2.6	3.4	11	8.2
17	8.8	2.2	3.4	43	2.6	3.4	3.8	4.9	3.4	3.4	9.5	8.8
18	6.3	5.7	3.8	26	2.6	1.8	3.4	4.9	5.7	3.0	23	16
19	5.3	23	2.2	14	1.8	1.6	3.4	4.5	3.8	3.0	32	8.2
20	4.9	3.4	2.6	12	1.8	1.6	3.4	4.1	3.4	3.0	21	8.2
21	4.1	3.0	2.6	13	1.6	1.6	3.4	4.5	3.0	3.0	16	7.6
22	4.1	2.6	4.9	11	1.4	1.6	3.4	4.1	3.0	2.6	13	7.0
23	3.4	2.2	2.6	8.2	1.4	1.6	3.4	4.1	3.0	2.6	11	5.7
24	3.4	2.2	2.2	7.6	1.6	1.6	3.4	3.4	2.6	2.6	16	5.3
25	3.4	1.8	2.6	16	1.4	1.8	3.4	3.4	2.6	2.6	15	4.9
26	3.4	1.8	1.8	10	2.6	1.8	3.0	3.4	2.6	2.6	21	4.5
27	3.4	1.8	1.8	8.2	1.8	5.3	3.0	3.8	2.6	2.6	17	4.5
28	2.6	1.8	3.0	5.7	1.6	4.9	2.6	3.4	2.6	2.2	13	4.1
29	2.6	.....	2.6	5.3	1.4	3.4	2.6	3.4	2.6	2.2	11	4.1
30	2.2	.....	2.6	4.1	1.4	7.6	2.6	3.4	2.6	2.2	9.5	3.8
31	2.2	.....	9.5	.....	1.4	.....	2.6	4.1	.....	2.2	.....	3.8

Monthly discharge of Hoolawaliilii Stream near Huelo, Maui, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	28	2.2	7.15	440	B.
February	36	1.8	5.20	289	B.
March	9.5	1.4	2.47	152	B.
April	43	1.8	12.8	762	C.
May	4.1	1.4	2.32	143	B.
June	7.6	1.3	2.66	158	B.
July	16	2.6	5.02	309	B.
August	23	2.2	4.56	280	B.
September	5.7	2.6	2.97	177	B.
October	9.5	2.2	3.23	199	B.
November	37	2.2	14.7	875	B.
December	41	3.8	12.1	744	B.
The year	43	1.3	6.25	4,530	

HONOPOU STREAM NEAR HUELO, MAUI.

Location.—Three-fourths mile northwest of Lupi and about 3½ miles southwest of Huelo; 200 feet above New Hamakua ditch crossing.

Records available.—December 10, 1910, to December 31, 1913.

Gage.—Vertical staff.

Control.—Probably permanent.

Discharge measurements.—Made by wading.

Diversions.—None above station.

Accuracy.—Records good.

Cooperation.—Station maintained in cooperation with East Maui Ditch Co.

Discharge measurements of Honopou Stream near Huelo, Maui, in 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 5	C. T. Bailey	0.10	1.55	Nov. 19	C. T. Bailey	0.79	19.5
Aug. 27	E. O. Christiansen.	.20	3.01				

Daily discharge, in second-feet, of Honopou Stream near Huelo, Maui, for 1912–13.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.												
1	3.3	0.9	7.0	5.1	4.2	1.9	1.5	1.2	1.0	1.0	5.3	4.2
2	3.3	.9	8.3	4.4	4.2	1.7	1.5	1.0	2.8	1.5	4.2	13
3	2.9	.9	8.0	6.5	4.0	1.5	2.0	1.0	1.7	.9	7.2	25
4	2.9	.9	6.8	32	5.1	1.5	2.8	.9	2.8	.6	4.2	12
5	2.6	.9	6.2	21	3.7	1.5	1.9	.9	1.5	.6	3.3	7.8
6	2.6	.8	6.0	13	3.7	1.5	1.7	.9	1.5	.6	3.3	7.0
7	2.6	.8	6.0	18	3.3	1.4	1.9	.9	2.2	.6	2.9	7.2
8	2.4	.9	5.1	19	3.7	1.4	1.7	.9	1.7	.6	2.6	6.5
9	2.2	1.9	6.2	18	3.3	1.4	4.6	.9	1.5	.6	19	4.6
10	2.2	1.2	5.5	13	2.9	2.2	1.9	1.4	1.2	.6	8.6	5.1
11	1.9	1.2	12	12	2.8	1.9	2.6	2.2	1.2	.6	7.0	4.6
12	1.9	1.2	9.2	11	2.6	1.9	1.9	1.2	1.0	.6	5.1	4.2
13	1.9	3.3	12	9.2	2.6	1.9	1.9	1.2	1.0	.6	4.6	3.7
14	1.9	2.0	8.6	11	2.4	1.7	1.7	1.5	.9	49	4.2	3.7
15	1.7	1.4	7.5	11	2.2	1.9	1.7	3.7	.9	1.2	3.7	3.5
16	1.7	1.2	6.0	9.2	2.0	1.9	1.7	1.9	.9	.9	8.0	3.5
17	1.5	1.0	6.2	8.0	2.0	1.5	1.5	1.2	.9	.6	9.5	4.2
18	1.5	.9	11	7.5	2.0	1.5	1.5	1.0	.9	.6	12	4.2
19	1.4	2.9	6.5	7.0	2.0	1.5	1.5	.9	.8	.6	10	7.5
20	1.2	3.7	6.5	8.3	2.2	1.5	1.5	.9	.9	.6	7.8	5.1
21	1.2	6.0	5.5	6.5	2.0	1.5	1.5	.9	.8	2.9	6.2	14
22	1.2	7.5	5.1	5.5	1.9	1.5	1.4	1.9	.8	3.5	6.0	16
23	1.2	4.8	4.6	6.5	1.7	1.4	1.4	.9	.8	3.3	5.5	16
24	2.0	4.2	4.2	5.8	1.9	2.9	1.9	.9	.8	2.6	5.1	10
25	1.5	4.0	3.7	5.5	1.5	1.9	1.9	.9	.6	2.2	5.5	8.9
26	1.5	4.2	3.7	6.5	2.6	1.7	1.5	.8	.6	2.4	5.1	8.0
27	1.4	9.5	3.5	5.8	3.5	1.7	1.4	.8	.6	10	5.1	7.0
28	1.2	10	3.3	5.1	2.9	1.7	1.7	.8	.6	12	4.2	7.5
29	1.2	6.5	3.3	5.1	2.9	1.5	1.5	.9	.9	4.2	3.5	7.0
30	1.0	.....	3.7	4.6	2.0	1.5	1.2	.9	1.5	5.1	3.3	6.0
31	1.0	.....	4.4	.....	2.2	.....	1.2	.9	.....	8.3	.....	5.1
1913.												
1	5.5	2.2	2.0	5.5	4.6	1.4	3.7	1.2	1.5	0.9	0.9	7.0
2	4.6	2.2	1.9	3.3	4.2	1.2	8.6	1.2	1.5	.9	.9	6.5
3	4.2	2.0	1.9	2.6	4.0	1.2	4.6	1.2	1.5	.9	2.9	7.0
4	3.5	1.9	1.7	2.6	3.7	2.2	4.6	1.2	1.4	.9	3.5	36
5	3.3	1.9	1.7	2.4	3.3	1.5	4.2	1.0	1.2	.9	2.2	29
6	3.1	33	1.5	2.2	3.3	1.4	4.8	1.2	1.2	1.2	2.2	22
7	2.9	3.3	1.7	2.2	3.1	1.5	4.0	3.7	1.2	1.4	1.9	16
8	5.1	2.6	1.5	2.0	2.9	1.4	3.7	1.5	1.2	5.3	17	17
9	5.1	2.2	2.2	2.4	2.6	1.5	3.5	1.2	1.2	1.9	22	13
10	5.3	2.2	1.5	2.0	2.6	1.9	3.3	1.2	1.4	1.5	20	11
11	4.4	2.0	1.5	15	2.4	1.2	3.1	1.0	1.2	1.2	16	9.2
12	3.7	1.9	1.4	8.0	2.6	4.2	2.9	10	1.2	1.2	24	8.9
13	22	1.9	1.2	20	2.4	3.7	2.9	3.3	1.2	3.7	11	7.5
14	16	1.9	1.2	16	2.6	2.9	2.9	2.9	1.0	2.2	11	16
15	26	1.9	3.7	26	3.7	2.6	2.8	6.8	.9	1.5	9.8	10
16	20	2.0	2.9	21	2.9	2.2	2.6	3.5	1.2	1.4	8.3	8.6
17	6.5	1.9	2.9	31	3.3	1.9	2.2	3.1	1.9	1.2	7.5	9.2
18	5.3	4.2	2.9	17	2.6	1.5	2.2	2.8	3.3	1.2	14	12
19	5.1	19	2.2	12	2.6	1.5	2.0	2.6	2.0	1.2	22	8.3
20	4.6	3.7	2.2	11	2.2	1.5	2.0	2.6	1.2	1.0	15	7.2
21	3.7	3.3	2.6	13	1.9	1.5	1.9	2.6	1.2	1.0	15	6.5
22	3.3	3.1	4.6	9.2	1.7	1.5	1.9	2.2	1.0	1.0	10	6.0
23	3.3	2.9	2.6	8.0	1.7	1.5	1.7	2.0	.9	1.0	9.2	5.5
24	2.9	2.8	2.0	7.8	1.9	1.5	1.7	1.9	.9	.9	12	5.1
25	2.9	2.6	2.6	11	1.9	1.5	1.5	1.9	.9	.9	14	5.1
26	2.8	2.4	1.9	7.0	2.4	1.9	1.5	1.9	.9	.9	15	4.6
27	2.6	2.2	1.9	8.6	1.9	4.4	1.5	2.0	.9	.9	13	4.2
28	2.6	2.2	2.8	6.5	1.7	2.9	1.5	1.9	.9	.9	11	3.7
29	2.4	.....	2.2	5.8	1.5	2.2	1.4	1.9	.9	.9	8.6	3.3
30	2.2	.....	2.2	5.1	1.5	4.6	1.4	1.5	.9	.9	8.0	3.1
31	2.2	.....	6.5	.....	1.5	.....	1.2	1.9	.....	.9	.....	3.1

Monthly discharge of Honopou Stream near Huelo, Maui, for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
January	3.3	1.0	1.87	115	B.
February	10	.8	2.95	170	B.
March	12	3.3	6.31	388	B.
April	32	4.4	10.0	595	A.
May	5.1	1.5	2.77	170	B.
June	2.9	1.4	1.68	100	B.
July	4.6	1.2	1.79	110	B.
August	3.7	.8	1.17	71.9	B.
September	2.8	.6	1.18	70.2	C.
October	49	.6	3.85	237	C.
November	19	2.6	6.07	361	B.
December	25	3.5	7.81	480	B.
The year	49	0.6	3.95	2,870	
1913.					
January	26	2.2	6.04	371	B.
February	33	1.9	4.12	229	C.
March	6.5	1.2	2.31	142	B.
April	31	2.0	9.54	568	B.
May	4.6	1.5	2.62	161	B.
June	4.6	1.2	2.06	123	B.
July	8.6	1.2	2.83	174	B.
August	10	1.0	2.42	149	B.
September	3.3	.9	1.26	75	B.
October	5.3	.9	1.35	83	B.
November	24	.9	10.9	649	A.
December	36	3.1	10.1	621	A.
The year	36	0.9	4.62	3,340	

MISCELLANEOUS MEASUREMENTS.

Measurements of streams on the island of Maui at points other than regular gaging stations are listed below:

Miscellaneous discharge measurements on Maui for 1913.

Date.	Stream.	Locality.	Gage height.	Discharge.
			Feet.	*Sec.-ft.*
Mar. 15	South Waiehu	Wailuku	0.60	0.69
Apr. 9	Waikapu (North Fork)[a]	Old shops below tunnel portal		2.68
9	do	300 feet above junction with South Fork.		2.73
16	Olowalu	Olowalu	.89	51.6
16	Olowalu ditch No. 2	do	1.35	16.9
June 5	Nailiihaele	Huelo	.81	2.16
7	New Hamakua ditch, Gage No. 5	do	4.80	42.4
7	New Hamakua ditch, Gage No. 4	do	4.65	37.0
7	New Hamakua ditch, Gage No. 3	do	2.30	31.6
7	New Hamakua ditch, Gage No. 1	do	2.80	34.3
7	New Hamakua ditch	Halehaku Weir, Huelo	.86	73.0
June 18	Halehaku	Huelo	.25	2.63
July 21	Lower Springs	Kalepo Gulch, near Kaupo		.44
21	Upper Springs	do		.22
21	Manawainui	Below large springs, near Kaupo.		2.03
21	do	Above large springs, near Kaupo.		1.22
July 22	Alelele	Near Kipahulu		.36
22	Oheo	Wooden bridge near Kipahulu		1.17
22	Puaaluu	do		2.24
22	Halalawe	do		1.86
22	Honolewa	do		1.29
22	Kaili	do		1.88
23	Makapipi	Near Keanae		1.71
23	East Wailuaiki	do		7.00
Sept. 30	Lahainaluna ditch	At Intake near Lahaina		2.76
30	do	Above Intake near Lahaina		4.48
Apr. 14	Kahoma	Near Lahaina	1.16	9.21
Aug. 19	do	do	.62	.19

[a] Tributary to Waikapu Stream.

Miscellaneous discharge measurements on Maui for 1913—Continued.

Date.	Stream.	Locality.	Gage height.	Discharge.
			Feet.	*Sec.-ft.*
Apr. 15	Kauaula	Near Lahaina	1.35	63.4
29	do.[a]	do	.96	10.8
May 14	do	do	1.44	40.6
Aug. 19	do	do	1.04	8.84
Apr. 16	Ukumehame	Near Olowalu	1.40	72.8
21	do	do	.72	11.6
22	do.[b]	do	1.15	11.8
May 15	do	do	1.38	36.6
Aug. 20	do	do	.84	6.37
June 18	Opana	Near Huelo	1.81	.29
Nov. 18	Honomanu	Near Keanae	6.02	554
20	do	do	3.61	32

[a] New gage established May 15, 1913. [b] New datum; gage moved to better location.

ISLAND OF HAWAII.

GENERAL CONDITIONS.

The perennial streams of the Island of Hawaii are mainly included in two groups, one comprising an area about 10 miles wide, in the Kohala and Hamakua districts, and the other an area about 16 miles wide in the Hilo district between the South Branch of Wailuku River on the southeast and Maulua Gulch on the northwest.

The low water run-off from the Kohala and Hamakua districts is now practically all diverted into ditches serving the sugar lands of the north coast of the island. Only a small part of the mean run-off from the Hilo district is now being utilized, the greater part being allowed to waste into the sea.

It has been proposed to construct a high-line canal at an elevation of about 2,700 feet and carry this water to serve either the semiarid lands of Kau on the south side of the island, or the dry government lands in the vicinity of Waimea which are now being leased for cattle range.

In September, 1911, a concession was sought, and later granted, by a promotor for the construction of what was generally known as the Kau ditch project, and at the request of the territorial officials the work of investigating the run-off of the Hilo district along the 2,700-foot contour was begun. In September, October, and November, 1911, a foot trail was cut through the swamp and jungle from the South Branch of Wailuku River to the North Branch of Kawainui River, a distance of about 8 miles by trail. Staff gages were established on all appreciable channels, whether of perennial discharge or not.

Eighty-three stations were established and a camp was built about midway on the trail. Lack of funds prohibited further extension of the work and the construction of bridges or cables across the large gulches with the result that the larger streams could not be crossed when in flood. The trail was merely a passage cut through the

jungle, over and under logs, in and out of gulches, and, for the greater part, from a few inches to several feet deep in swamp muck. Two gage readers were employed who lived in the midway camp and who went over the trail once a day on an average of about four days in the week and read the gages—one man working south and the other north and return. The condition of the trail was such that about eight hours were necessary to cover the 8-mile trip. All supplies for the camp and work were packed in on men's backs from the end of the Kaiwiki homestead road, a distance of about 3½ miles. One day of the week was allowed the observers for packing in supplies, and one day for rest. Up until May, 1913, when funds became available for the construction of cableways across the larger gulches, many daily records were lost on account of the observers being unable to cross these gulches when in flood. On account of the flashy type of the streams it was found that two readings daily, within a few hours of each other, gave a very poor index of the daily mean gage heights of the streams.

In the spring of 1913 it became apparent that the Kau ditch project would not soon be completed, and this fact, coupled with the high cost of obtaining the unsatisfactory and meager data on surface fluctuation, led to the suspension of the work until funds would be available to construct a dry trail across the entire district, to establish water-stage recorders on the larger streams, and to improve cross sections, controls, and other features. The work was suspended on July 18, 1913.

Ten rain gages read at monthly and bimonthly periods were established at approximately 500-foot elevation intervals from sea level to 5,000 feet, the approximate elevation at which the wet, or forest, zone meets the arid lava slopes of Mauna Kea Mountain. Practically all rainfall above the 5,000-foot contour is absorbed by the porous lava. Rainfall observations were terminated on June 30, 1913.

HILO GROUP.

STATIONS AT 2,700-FOOT LEVEL.

Location.—On trail in forest back of Hilo, at approximately 2,700 feet above sea level. The trail is about 8 miles long and the camp, about midway on the trail, is reached by a foot trail 3½ miles long from the end of the Kaiwiki homestead road. The camp is about 7 miles west-northwest from Hilo. Beginning at the South Branch of Wailuku River, the stations are numbered from 1 to 18 and from 25 to 87, including stations Nos. 12a and 86a, to the North Branch of Kawainui River. There are no stations numbered 19 to 24.

Records available.—Stations 1–12, October 6, 1911, to July 18, 1913. Station 12a, November 30, 1912, to July 18, 1913. Stations 13–18, 25–27, October 5, 1911, to July 18, 1913. Stations 28–41, September 28, 1911, to July 18, 1913. Stations 42–47, September 28, 1911, to July 18, 1913. Stations 48–50, September 31, 1911, to July 18, 1913. Stations 51–52, October 7, 1911, to July 18, 1913. Stations

53–65, October 10, 1911, to July 19, 1913. Stations 66–68, October 21, 1911, to July 18, 1913. Stations 69–74, November 13, 1911, to July 18, 1913. Stations 75–86, November 14, 1911, to July 18, 1913. Station 86a, November 18, 1912, to July 18, 1913. Station 87, November 14, 1911, to July 18, 1913.

Drainage area.—About 75 square miles for all stations (may be in error 20 per cent).

Gages.—Vertical staff read to nearest two-hundredths, twice daily, about 4 days in the week.

Diversions.—All low-water run-off is diverted below the stations, but it is estimated that less than 20 per cent of the mean discharge is being utilized; no diversions above the stations.

Accuracy.—At only 24 of the 83 stations maintained is the discharge sufficient to warrant current-meter measurements and ratings; mean discharge at each of the other 59 stations is one-half second-foot or less; the aggregate mean run-off of these 59 stations for the period January 1 to June 18, 1913, is estimated to have been only 4.2 second-feet. As the mean discharge of the 24 streams rated was 194.0 second-feet, the mean run-off for the 59 estimated stations was less than 2 per cent of the total. For these stations for which ratings have been made and results published rating curves are all fairly well defined for low and medium stages. Discharge for days for which there are no gage-height records was estimated from daily rainfall records at camp near station No. 51.

The total mean run-off for all stations for the period January 1 to July 18, 1913, was 198.2 second-feet. The minimum run-off, which was less than 6 second-feet, occurred in March. The maximum run-off of all stations probably exceeded 5,000 second-feet.

Discharge measurements made at unrated stations on 2,700-foot level near Hilo, Hawaii, during the period Jan. 1 to July 18, 1913.

[E. O. Christiansen, hydrographer.]

Station No.	Date.	Gage height.	Discharge.	Station No.	Date.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
39	Apr. 24	0.90	0.23	50[a]	May 15	2.36	0.21
	May 16	.96	.44		...do	2.38	.23
41	Apr. 24	.49	.80		...do	2.39	.25
	May 16	1.00	2.4		May 21	2.19	.04
49	Apr. 23	.93	.83		May 22	2.18	.03
50[a]	May 4	2.38	1.22		...do	2.17	.03
	...do	2.28	.12		May 23	2.16	.03
	May 14	2.22	.06		May 24	2.14	.02
	...do	2.24	.08		May 29	2.24	.07
	...do	2.28	.11		May 30	2.20	.05
	May 15	2.23	.07		May 31	2.25	.08
	...do	2.26	.10	55	Apr. 18	1.22	1.03
	...do	2.28	.12	59	...do	.81	.77
	...do	2.30	.12	70	...do	.99	1.19
	...do	2.32	.13	73	...do	.90	.48
	...do	2.34	.18				

[a] All measurements on station No. 50 made by the volumetric method.

Discharge measurements of station No. 1 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 29	0.05	6.5
May 24	— .50	.96

Monthly discharge of station No. 1 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	48	11	19.4	1,190	D.
February	12	(a)	3.63	130	D.
March	.2	(a)	.07	1	D.
April	160	.1	18.6	1,110	D.
May	28	.4	5.14	316	D.
June	146	.6	25.9	1,540	D.
July 1–18	60	9.0	29.5	1,050	D.
The period				5,340	

[a] No flow.

Discharge measurements of station No. 3 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 29	0.40	7.02
May 24	.11	3.16

Monthly discharge of station No. 3 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	15	7.0	10.0	615	D.
February	5.5	(a)	.75	42	D.
March	5.8	(a)	1.74	107	D.
April	68	4.7	13.4	797	D.
May	11	2.5	4.70	289	D.
June	53	2.9	11.8	702	D.
July 1–18	32	2.7	13.4	477	D.
The period				3,030	

[a] No flow.

Discharge measurements of station No. 12 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 29	1.18	7.5
May 24	.99	2.8

Monthly discharge of station No. 12 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	34	2.8	12.5	769	D.
February	2.8	.3	1.03	57	D.
March	6.1	.3	1.47	90	D.
April	63	3.0	12.0	714	D.
May	6.1	2.0	3.48	214	D.
June	57	2.3	10.9	649	D.
July 1–18	53	2.2	13.3	474	D.
The period				2,970	

Discharge measurements of station No. 13 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 29	1.05	9.2
May 24	.74	2.25

Monthly discharge of station No. 13 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	38	4.5	12.8	787	D.
February	3.9	.2	1.09	60	D.
March	11	(a)	2.94	181	D.
April	54	5.1	12.8	762	D.
May	9.4	2.1	4.62	284	D.
June	47	3.2	11.3	672	D.
July 1–18	44	1.9	13.6	483	D.
The period				3,230	

a No flow.

Discharge measurements of station No. 15 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 29	1.26	3.4
May 24	1.10	.64

Monthly discharge of station No. 15 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	17	0.7	5.78	355	D.
February	.5	.2	.37	20	D.
March	4.0	(a)	.74	46	D.
April	58	1.4	9.57	569	D.
May	3.3	.7	1.31	81	D.
June	25	.8	4.70	280	D.
July 1–18	29	.6	6.69	238	D.
The period				1,590	

[a] No flow.

Discharge measurements of station No. 27 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 24	1.63	4.1
May 16	1.81	8.4

Monthly discharge of station No. 27 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	30	2.3	7.93	488	D.
February	2.3	.4	1.00	56	D.
March	4.0	.2	1.62	100	D.
April	48	2.9	8.61	512	D.
May	6.2	1.2	2.70	166	D.
June	41	1.8	8.33	496	D.
July 1–18	38	1.8	1.02	365	D.
The period				2,180	

Discharge measurements of station No. 28 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 24	0.90	10.0
May 16	1.85	41.5

Monthly discharge of station No. 28 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	176	8.0	60.7	3,730	D.
February	6.0	.1	2.45	136	D.
March	9.8	(a)	1.27	78	D.
April	181	2.0	26.5	1,580	D.
May	14	.4	3.06	188	D.
June	135	1.0	19.7	1,170	D.
July 1–18	90	.3	22.0	785	D.
The period				7,670	

[a] No flow.

Discharge measurements of station No. 31 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 24	0.80	4.76
May 16	1.05	9.44

Monthly discharge of station No. 31 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	52	2.6	14.0	861	D.
February	2.5	.2	.76	42	D.
March	17	(a)	2.23	137	D.
April	115	3.2	18.0	1,070	D.
May	8.5	1.1	2.94	181	D.
June	34	1.7	8.05	479	D.
July 1–18	50	.9	11.2	402	D.
The period				3,170	

a No flow.

Discharge measurements of station No. 34 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 24	1.07	0.90
May 16	1.14	1.90

Monthly discharge of station No. 34 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	16	0.2	2.51	154	D.
February	.6	.2	.27	15.0	D.
March	2.6	.2	.47	28.9	D.
April	24	.6	3.63	216	D.
May	1.3	.3	.63	38.7	D.
June	7.1	.4	1.35	80.3	D.
July 1–18	10	.3	2.12	75.6	D.
The period				608	

Discharge measurements of station No. 46 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 24	1.62	9.6
May 15	1.72	13.6

Monthly discharge of station No. 46 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	195	5.8	56.4	3,470	D.
February	4.4	(a)	1.49	83	D.
March	16	(a)	2.85	175	D.
April	188	6.1	32.4	1,930	D.
May	46	3.0	9.47	582	D.
June	104	4.4	21.7	1,290	D.
July 1–18	82	2.5	25.4	907	D.
The period				8,440	

a No flow.

Discharge measurements of station No. 47 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 24	1.88	3.6
May 15	1.80	3.0

Monthly discharge of station No. 47 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	42	1.9	10.6	652	D.
February	1.3	.3	.68	38	D.
March	7.0	.2	1.44	88	D.
April	25	2.1	5.51	328	D.
May	5.3	1.2	2.35	144	D.
June	15	1.4	5.00	298	D.
July 1–18	17	1.7	6.29	224	D.
The period				1,770	

Discharge measurements of station No. 52 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 23	1.06	21.2
May 21	.81	11.8

Monthly discharge of station No. 52 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	582	6.2	93.8	5,770	D.
February	7.6	1.1	3.57	198	D.
March	48	.4	10.1	621	D.
April	219	16	50.1	2,980	D.
May	74	6.6	17.8	1,090	D.
June	342	8.9	52.6	3,130	D.
July 1–18	155	7.4	49.5	1,760	D.
The period				15,500	

Discharge measurements of station No. 54 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 18	0.89	1.63

Monthly discharge of station No. 54 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	44	0.2	7.39	454	D.
February	.5	(a)	.13	7	D.
March	13	(a)	1.32	81	D.
April	28	1.5	5.88	350	D.
May	3.4	.2	.80	49	D.
June	14	.1	2.67	159	D.
July 1–18	18	(a)	3.50	125	D.
The period				1,230	

a No flow.

Discharge measurements of station No. 62 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 18	1.39	8.6
May 22	1.09	2.2

Monthly discharge of station No. 62 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	128	1.1	24.6	1,510	D.
February	2.2	(a)	9.95	553	D.
March	39	(a)	4.67	287	D.
April	100	5.3	20.5	1,220	D.
May	14	1.5	3.82	235	D.
June	42	1.8	11.0	655	D.
July 1-18	61	1.3	14.2	505	D.
The period				4,960	

a No flow.

Discharge measurements of station No. 68 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 18	1.58	11.0
May 22	.98	3.1

Monthly discharge of station No. 68 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	42	1.9	15.3	941	D.
February	3.8	.8	1.76	98	D.
March	26	.5	5.37	330	D.
April	52	7.2	17.3	1,030	D.
May	17	2.2	6.02	370	D.
June	29	3.0	11.5	684	D.
July 1–18	47	2.1	13.3	474	D.
The period				3,930	

Discharge measurements of station No. 69 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 18	0.84	4.3
May 22	.70	1.2

Monthly discharge of station No. 69 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	11	0.6	5.25	323	D.
February	1.7	.3	.60	33	D.
March	10	.2	1.85	114	D.
April	22	2.8	7.13	424	D.
May	3.8	.8	1.68	103	D.
June	10	1.2	3.70	220	D.
July 1–18	17	1.1	4.65	166	D.
The period				1,380	

Discharge measurements of station No. 74 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 18	2.06	12.5
May 22	1.71	4.0

Monthly discharge of station No. 74 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	46	2.9	18.2	1,120	D.
February	4.7	.8	2.00	111	D.
March	23	.4	5.46	336	D.
April	52	1.1	16.9	1,010	D.
May	24	3.1	7.80	480	D.
June	62	4.1	14.1	839	D.
July 1–18	56	3.1	16.5	589	D.
The period				4,480	

Discharge measurements of station No. 76 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 23	1.01	1.86

Monthly discharge of station No. 76 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	10	0.6	3.90	240	D.
February	1.0	.3	.48	26.6	D.
March	7.8	.2	1.15	70.7	D.
April	9.3	1.0	2.60	155	D.
May	2.0	.6	.98	60.3	D.
June	8.7	.7	1.96	117	D.
July 1–18	15	.5	2.32	82.8	D.
The period				752	

Discharge measurements of station No. 79 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 23	0.93	0.83

Monthly discharge of station No. 79 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	2.5	0.2	1.06	65.2	D.
February	.2	.1	.15	8.3	D.
March	2.3	.1	.37	22.8	D.
April	3.2	.1	1.08	64.3	D.
May	.9	.2	.37	22.8	D.
June	2.4	.2	.75	44.6	D.
July 1-18	3.7	.2	.93	33.2	D.
The period				261	

Discharge measurements of station No. 80 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 23	1.22	1.71
May 22	.87	.52

Monthly discharge of station No. 80 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	3.6	0.5	2.04	125	D.
February	.6	(a)	.38	21.1	D.
March	3.7	(a)	.67	41.2	D.
April	4.0	1.0	2.30	137	D.
May	1.6	.4	.81	49.8	D.
June	3.6	.5	1.52	90.4	D.
July 1-18	4.5	.4	1.81	64.5	D.
The period				529	

a No flow.

Discharge measurements of station No. 81 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 23	1.00	4.1
May 23	.69	1.9

Monthly discharge of station No. 84 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	12	1.0	5.98	368	D.
February	1.4	.2	.59	33	D.
March	11	.1	2.19	135	D.
April	15	3.3	7.01	417	D.
May	7.0	1.0	2.44	150	D.
June	21	1.3	7.80	464	D.
July 1–18	38	3.3	11.2	399	D.
The period				1,970	

Discharge measurements of station No. 85 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 23	0.88	1.90
May 23	.79	.77

Monthly discharge of station No. 85 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	6.9	1.7	4.07	250	D.
February	3.0	.7	1.37	76	D.
March	7.5	.6	2.09	129	D.
April	13	1.6	4.78	284	D.
May	2.8	.5	1.06	65	D.
June	7.3	.6	2.37	141	D.
July 1–18	14	.6	3.68	131	D.
The period				1,080	

Discharge measurements of station No. 86 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Apr. 23	1.70	5.1
May 23	1.56	1.6

Monthly discharge of station No. 86 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	12	2.3	6.93	426	D.
February	3.2	.5	1.58	88	D.
March	12	.1	2.81	173	D.
April	19	4.0	8.07	480	D.
May	9.3	1.4	2.76	170	D.
June	19	1.7	5.66	337	D.
July 1–18	20	1.7	6.79	242	D.
The period				1,920	

Discharge measurements of station No. 87 at 2,700-foot level near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
April 23	1.30	1.39
May 23	1.04	.91

Monthly discharge of station No. 87 at 2,700-foot level near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	5.5	0.7	2.80	172	D.
February	2.2	.4	.74	41	D.
March	4.7	.3	1.19	73	D.
April	7.9	1.8	3.77	224	D.
May	3.8	.7	1.61	99	D.
June	8.1	1.0	2.93	174	D.
July 1–18	10	.9	3.52	126	D.
The period				909	

WAILUKU RIVER NEAR HILO, HAWAII.

Location.—About 1½ miles west of Hilo, a short distance above Hilo Electric Light Co. intake.
Records available.—March 21, 1911, to July 21, 1913.
Gage.—Barrett & Lawrence water-stage recorder.
Control.—Probably slightly shifting.
Discharge measurements.—Made from cable.
Accuracy.—Records good for January and June; for other months only fair.

Discharge measurements of Wailuku River near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Jan. 9	8.00	703	May 6	5.68	157
Mar. 7	5.50	55.4	May 20	5.64	152
Mar. 13	5.23	32.5	June 17	7.55	523
Apr. 7	6.04	209	June 25	6.00	197
Apr. 26	6.25	254	July 7	7.54	567

Daily discharge, in second-feet, of Wailuku River near Hilo, Hawaii, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	484	127	88	350	190	94	700
2	364	116	93	323	250	84	657
3	325	104	84	228	306	100	568
4	265	91	71	165	254	97	479
5	225	87	66	133	187	87	364
6	195	84	62	201	155	76	855
7	187	89	122	216	134	72	614
8	1,290	84	98	148	116	78	426
9	1,040	78	84	171	112	80	316
10	1,250	69	70	187	106	76	264
11	3,350	64	69	140	94	69	222
12	1,170	60	53	511	85	73	206
13	2,100	52	107	1,620	82	9,400	206
14	3,090	48	104	3,110	103	6,140	162
15	3,700	44	57	834	139	3,110	139
16	1,620	58	41	630	426	1,260	117
17	1,200	84	43	484	250	568	107
18	814	62	95	378	325	403	97
19	1,630	50	127	314	200	314	88
20	1,450	48	80	264	150	254	85
21	1,400	44	59	254	121	203	101
22	1,180	38	140	269	98	175	.....
23	700	38	166	236	84	158	.....
24	525	35	84	203	84	219	.....
25	418	34	66	275	84	203	.....
26	347	34	55	245	82	180	.....
27	283	33	50	348	79	139	.....
28	236	54	203	273	78	127	.....
29	203	.....	219	228	79	152	.....
30	172	.....	145	211	78	187	.....
31	145	.....	568	.....	78	.....	.....

Monthly discharge of Wailuku River near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	3,700	145	1,010	62,100	A.
February	127	33	64.6	3,590	C.
March	568	41	109	6,700	B.
April	3,110	133	432	25,700	B.
May	426	78	149	9,160	B.
June	9,400	69	806	48,000	A.
July 1–21	855	85	322	13,400	B.
The period				169,000	

HONOLII RIVER AT KAIWIKI, NEAR HILO, HAWAII.

Location.—About one-half mile north of Kaiwiki and 6 miles west of Hilo.
Records available.—June 1, 1911, to March 24, 1913.
Gage.—Barrett & Lawrence water-stage recorder.
Control.—Probably slightly shifting.
Discharge measurements.—Made from footbridge.
Accuracy.—Records good.

Discharge measurements of Honolii River at Kaiwiki, near Hilo, Hawaii, in 1913.

[E. O. Christiansen, hydrographer.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Jan. 31	5.10	18.1
May 31	5.11	19.4

Daily discharge, in second-feet, of Honolii River at Kaiwiki, near Hilo, Hawaii, for 1913.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
1	153	16	3.4	16	238	18	12
2	86	15	3.4	17	182	40	30
3	79	12	3.0	18	155	18	86
4	56	11	3.0	19	358	14	110
5	43	11	2.8	20	318	11	37
6	42	16	2.8	21	268	9.4	23
7	48	30	8.6	22	202	9.0	103
8	430	17	6.2	23	108	7.0	80
9	315	13	3.8	24	83	7.0	35
10	299	11	2.8	25	65	7.0	.....
11	724	11	2.4	26	48	5.0	.....
12	196	11	2.0	27	38	3.0	.....
13	512	10	1.8	28	32	3.0	.....
14	840	8.6	2.0	29	27	.....	.....
15	660	8.6	18	30	24	.....	.....
				31	17	.....	.....

Monthly discharge of Honolii River at Kaiwiki, near Hilo, Hawaii, for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	842	17	214	13,200
February	50	3.0	12.6	700
March 1–24	110	1.8	24.2	1,150

HAMAKUA GROUP.

HAMAKUA DITCH AT MAIN WEIR, PUUALALA, NEAR WAIMEA, HAWAII.

Location.—Near head of ditch in Lalakea tract, adjacent to forest reserve and close to Kaala Mountain and Pacific Sugar Mill fence. This ditch diverts all run-off from upper headwaters of Waipio.

Records available.—January 1 to December 31, 1913.

Gage.—Water-stage recorder.

Discharge.—Measured by weir consisting of two 5-foot panels, sharp crested, and with good stilling basin above.

Discharge, in million gallons per day, of Hamakua ditch at main weir, at Puualala Waimea, Hawaii, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.35	1.07	0.96	8.42	2.21	2.09	18.3	1.05	2.66	0.37	.....	1.25
2	2.11	.87	.68	7.62	3.84	6.24	16.5	11.8	9.14	.30	.....	.95
3	4.21	.44	.54	3.86	6.25	7.70	12.7	11.0	10.2	.22	29.2	1.08
4	2.89	.32	.39	6.72	5.54	2.55	13.4	2.73	5.76	.18	22.7	5.06
5	2.53	.24	.32	3.42	2.94	1.53	8.78	1.39	2.30	.15	8.51	25.3
6	1.45	12.1	.26	5.09	1.56	1.14	26.8	.85	1.79	.23	3.24	19.8
7	1.04	11.0	.26	8.37	.93	1.75	20.9	.64	16.2	.32	1.68	9.33
8	.85	2.66	.20	2.80	.64	4.45	18.5	.64	5.75	.99	.98	4.55
9	1.04	1.45	.18	9.15	.61	4.96	8.55	1.31	2.50	1.32	18.7	3.50
10	3.70	.83	.18	8.02	.52	7.32	6.91	1.45	12.2	.74	20.6	2.27
11	2.66	.65	.13	20.5	.44	3.99	9.86	7.51	7.36	.37	16.1	1.60
12	1.67	.52	.13	24.9	6.21	12.7	16.2	21.3	11.6	.13	22.1	1.91
13	23.0	.39	.04	22.9	11.1	25.2	16.8	21.2	9.53	.13	17.1	1.47
14	24.6	4.26	5.61	15.6	3.72	20.5	13.8	11.3	3.61	.71	10.0	4.11
15	18.8	4.89	2.34	10.4	12.0	24.8	8.93	19.0	3.52	2.88	6.32	24.6
16	6.38	1.46	5.78	10.6	17.0	16.9	8.73	6.85	1.69	6.26	18.5	17.1
17	2.84	7.49	8.78	10.5	10.7	12.5	12.7	2.77	3.87	1.71	24.9	14.8
18	1.56	10.9	4.43	10.7	12.8	4.45	11.0	1.57	14.8	.60	30.0	13.5
19	1.26	20.6	4.97	8.41	17.9	2.90	5.16	1.08	9.65	.24	15.0	6.56
20	.95	10.4	2.94	5.03	6.59	2.25	6.08	.83	5.27	1.60	12.3	3.21
21	.74	10.2	11.9	4.36	2.64	1.62	10.1	.92	2.79	2.50	13.5	2.03
22	1.11	8.62	16.7	5.74	1.53	1.37	15.7	1.45	1.32	1.34	13.2	1.56
23	.95	3.54	4.78	7.46	1.42	6.43	6.47	.95	.68	1.87	9.60	13.3
24	.68	1.55	3.37	5.95	1.57	8.64	3.70	1.16	.52	.95	14.1	4.13
25	.68	2.58	4.06	8.01	2.68	3.94	3.40	1.14	.61	.37	14.6	1.79
26	.40	13.8	2.40	4.65	20.3	6.67	6.45	.68	.60	.15	12.5	1.25
27	.46	3.12	4.43	7.22	13.6	23.4	2.84	.62	.30	.86	10.3	.85
28	.55	1.37	24.6	8.02	18.3	27.5	5.28	1.20	.26	.56	3.90	.70
29	.37	.....	11.1	3.82	13.7	23.4	3.04	2.74	.32	.....	2.00	.52
30	.30	.....	13.9	2.58	6.22	22.3	1.68	10.7	.30	.....	1.68	.40
31	.24	.....	16.2	.....	3.60	.....	1.45	5.04	.....	.....	.....	.30

NOTE.—No discharge Oct. 29 to Nov. 2.

Monthly discharge of Hamakua ditch at main weir, Puualala, Waimea, Hawaii, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	24.6	0.24	3.66	348
February	20.6	.24	4.90	422
March	24.6	.04	4.92	468
April	24.9	2.58	8.69	800
May	20.3	.44	6.74	641
June	27.5	1.14	9.70	893
July	26.8	1.45	10.3	980
August	21.3	.62	4.93	469
September	16.2	.26	4.90	451
October 1–28	6.26	.13	1.00	86
November 3–30	30.0	.98	13.3	1,140
December	25.3	.30	6.09	579
The period	.....	.....	.....	7,300

NEW HAMAKUA DITCH AT MAIN WEIR NEAR KUKUIHAELE, HAWAII.

Location.—Near head of ditch, about 500 feet south of office of Hawaiian Irrigation Co. (Ltd.), at Kukuihaele.

Records available.—July 18, 1910, to December 31, 1913.

Gage.—Water-stage recorder.

Discharge.—Measured by weir consisting of six 5-foot panels, sharp crested, and with a good stilling basin above. Discharge measurements made in ditch below weir have checked weir discharge to within 2 per cent.

Diversion.—Ditch diverts all run-off from headwaters of Waipio basin below the upper Hamakua ditch.

Cooperation.—Daily-discharge record furnished by the Hawaiian Irrigation Co. (Ltd.).

Discharge, in million gallons per day, of New Hamakua ditch at main weir, Kukuihaele, Hawaii, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	32.3	27.1	26.7	34.6	29.1	28.7	41.4	26.0	28.6	25.7	23.9	30.6
2	30.5	27.3	26.3	33.1	32.3	30.7	42.2	32.3	32.7	25.2	23.7	30.2
3	31.1	25.5	26.0	30.7	34.0	32.9	38.5	37.2	41.5	25.0	43.8	30.1
4	30.9	26.0	26.0	31.5	32.1	29.3	38.9	30.4	34.0	24.9	41.5	32.1
5	30.7	25.9	25.9	29.6	29.7	27.5	33.4	27.5	30.4	24.8	38.2	34.2
6	29.9	31.5	25.6	29.1	27.9	26.9	42.0	26.7	29.4	25.3	33.4	33.7
7	29.3	34.9	25.5	32.8	27.3	27.5	42.0	26.2	42.7	25.1	30.9	34.0
8	28.7	30.0	25.3	28.9	26.8	28.9	42.0	27.6	34.2	25.1	29.7	34.0
9	28.7	27.9	25.4	31.3	26.2	28.9	38.9	28.1	30.8	25.2	34.7	34.0
10	30.3	26.6	24.8	32.9	26.2	29.9	36.6	28.1	39.2	24.6	34.2	34.0
11	29.5	26.7	24.8	34.1	25.6	27.5	36.5	31.5	35.9	24.6	33.9	32.7
12	28.7	26.6	24.7	34.9	27.9	30.4	42.2	43.5	38.5	24.6	34.2	33.3
13	33.6	25.8	24.6	34.7	33.4	34.1	42.0	51.7	38.1	24.6	34.0	32.2
14	34.8	27.9	26.2	34.1	29.1	34.4	40.9	41.4	31.0	26.0	34.2	32.2
15	34.8	29.6	26.1	34.8	31.3	34.4	36.1	52.1	29.8	28.5	33.6	34.4
16	34.6	26.9	26.9	34.8	33.0	34.4	44.2	37.2	28.4	30.9	34.7	34.8
17	32.1	29.4	32.5	34.7	35.4	34.2	38.7	32.5	28.8	27.0	34.7	34.2
18	30.5	33.9	28.2	34.1	33.7	32.3	38.8	30.3	43.1	25.4	33.8	34.0
19	29.9	35.0	27.9	34.1	34.6	30.3	33.6	29.0	38.9	24.3	34.2	34.0
20	28.7	34.1	26.1	33.7	32.7	29.4	34.4	28.9	31.7	26.1	34.4	34.2
21	29.0	34.3	29.7	33.3	29.1	28.3	36.3	12.9	29.4	29.1	34.3	33.1
22	29.5	34.2	37.0	34.7	27.3	27.7	40.1	29.2	27.8	26.3	34.0	32.1
23	29.0	29.8	30.2	34.1	28.3	29.7	34.9	28.5	27.0	26.8	34.9	34.0
24	28.1	28.3	27.5	33.4	28.5	33.1	31.7	29.0	26.2	25.9	34.6	33.5
25	27.9	27.0	29.8	32.6	27.9	29.2	30.7	28.3	26.0	24.8	34.0	32.0
26	26.4	33.0	27.1	32.3	35.2	29.3	33.0	27.7	25.8	24.2	34.1	31.3
27	26.6	28.6	27.2	33.9	35.2	34.6	30.0	27.7	25.8	24.6	34.4	30.9
28	26.9	27.4	35.7	34.0	34.6	34.4	31.1	27.9	25.6	24.8	33.8	30.5
29	26.1	.....	35.8	31.5	34.6	34.4	29.7	30.1	25.5	24.2	32.0	30.1
30	26.0	.....	34.7	30.2	31.3	34.2	28.8	34.7	25.5	23.9	31.2	29.6
31	25.7	.....	36.1	.....	29.9	.....	28.0	31.9	.....	23.9	.....	29.0

Monthly discharge of New Hamakua ditch at main weir, near Kukuihaele, Hawaii, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	34.8	25.7	29.7	2,830	A.
February	35.0	25.5	29.3	2,520	A.
March	37.0	24.6	28.3	2,692	A.
April	34.9	28.9	33.0	3,040	A.
May	35.4	26.2	30.7	2,920	A.
June	34.6	26.9	30.9	2,840	A.
July	44.2	28.0	36.7	3,490	A.
August	52.1	12.9	31.5	3,000	A.
September	43.1	25.5	31.7	2,920	A.
October	30.9	23.9	25.5	2,430	A.
November	43.8	23.7	33.8	3,110	A.
December	34.8	29.0	32.5	3,090	A.
The year	52.1	12.9	31.1	34,900	

KOHALA GROUP.

KOHALA DITCH NEAR KOHALA, HAWAII.

Location of weirs.—The Kohala Ditch Co. (Ltd.) maintains three weirs which measure the discharge carried by the Kohala ditch. The Awini weir is on the southeast side of the east branch of Honokanenui Gulch at an elevation of 1,880 feet. The Niulii weir is about 3½ miles south of Niulii, Kohala district, at an elevation of 1,000 feet, and about 5 miles below the Awini weir. The Hawi weir is about 1½ miles south of the Hawi mill near the lower end of the ditch.

Records available.—Daily records at Awini and Niulii weirs kept by Kohala Ditch Co. July 1, 1907, to December 31, 1913. No record of flow at Hawi weir, which has been used mainly as a check on deliveries of water between Niulii and Hawi. The Niulii weir measures the amount of water shown by the Awini weir and also the inflow from the Honokanenui. The record for the Honokenenui is derived by subtracting the flow at the Awini weir from the flow at the Niulii weir.

Gages.—Vertical staffs graduated to hundredths.

Discharge measurements.—Each weir consists of three 5-foot panels with end contractions, sharp-beveled steel crest, and with very slight velocity of approach.

Diversion.—Ditch diverts and delivers to the plantations on the north coast of Hawaii all low-water run-off between the Honokane Gulch and the northwest point of the island below the 2,000-foot contour.

Cooperation.—Daily-discharge record furnished by Kohala Ditch Co. (Ltd.).

Discharge, in million gallons per day, of Kohala ditch at Awini weir, near Kohala, Hawaii, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.5	9.3	4.8	12.5	7.5	2.3	16.9	3.3	5.2	0.9	.....	6.6
2	11.0	9.8	4.0	11.5	8.8	.....	19.5	4.4	3.7	.9	.....	9.8
3	11.0	7.9	3.3	8.4	8.8	2.1	16.9	8.4	4.8	.9	11.5	9.8
4	10.5	5.2	3.7	6.2	7.5	6.2	14.6	6.2	4.8	.9	18.3	10.5
5	11.0	4.4	3.7	6.2	7.5	6.2	12.5	5.8	3.7	.5	13.6	20.7
6	10.5	10.5	3.7	7.5	7.0	4.0	20.7	5.2	3.0	.5	10.5	20.7
7	8.8	14.1	3.7	9.3	6.6	4.8	20.7	4.0	6.2	.5	7.0	20.7
8	9.8	9.8	3.7	6.2	5.2	5.8	16.9	4.0	6.2	1.5	5.2	20.7
9	10.5	7.9	3.3	5.2	4.4	5.8	14.6	3.3	5.2	1.2	20.1	20.1
10	12.5	4.4	3.0	7.5	4.4	5.8	12.0	4.0	6.2	2.1	20.1	19.5
11	10.5	4.4	2.7	12.5	4.4	5.2	10.5	4.0	7.9	1.5	20.1	16.9
12	10.5	3.3	2.7	15.7	6.6	5.2	14.6	16.9	7.0	.9	20.1	14.1
13	20.7	3.3	2.4	15.7	15.7	20.7	16.9	20.7	7.9	.7	15.2	12.5
14	20.7	9.3	2.4	15.7	15.7	20.7	14.6	20.7	6.2	.5	12.0	11.5
15	20.7	8.4	2.7	15.7	15.7	20.7	14.6	16.9	4.8	.5	10.5	20.7
16	13.0	6.6	2.7	15.7	14.6	16.3	12.5	15.2	4.0	1.5	12.0	20.7
17	12.5	11.0	2.7	14.6	14.6	13.6	10.5	12.5	3.7	1.2	20.1	20.7
18	11.0	11.5	3.3	15.7	11.5	9.8	8.4	7.5	7.9	.9	20.1	20.7
19	9.8	14.1	3.3	14.6	10.5	9.3	8.4	5.8	11.5	.7	20.1	16.9
20	9.8	11.5	3.3	14.6	8.8	6.6	7.5	4.8	7.0	.5	16.3	14.1
21	8.4	8.8	7.5	12.5	7.5	6.6	6.6	4.8	5.2	.5	20.1	12.5
22	8.4	8.8	12.5	11.5	6.2	5.2	7.9	4.0	4.4	.5	14.6	10.5
23	7.9	8.4	7.9	12.0	4.4	4.8	7.5	3.3	3.3	.5	13.6	15.7
24	7.9	6 6	4 8	9.8	4.0	5.2	6.6	2.7	2.7	.5	13.6	14.1
25	5.2	6.6	4.0	10.5	4.0	4.8	5.8	4.0	1.8	.5	12.5	12.5
26	5.2	14.1	4.0	9.8	12.0	4.8	6.2	2.1	1.8	.5	12.5	10.5
27	5.2	8.4	3.3	14.6	15.7	14.6	5.8	2.1	1.8	.3	11.0	9.8
28	4.8	6.6	12.0	13.0	12.0	20.7	5.8	2.1	1.2	.2	9.8	7.9
29	4.8	.....	10.5	10.5	13.6	20.7	5.2	2.1	1.2	.....	8.4	6.6
30	4.8	.....	7.5	9.3	10.5	20.7	4.4	5.8	1.2	.....	7.5	6.2
31	4.8	.....	12.5	.....	7.5	.....	4.4	5.8	.....	.....	.....	6.2

NOTE.—No record June 2, Oct. 29 to Nov. 2.

Monthly discharge of Kohala ditch at Awini weir, near Kohala, Hawaii, for 1913.

Month.	Discharge in million gallons per per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	20.7	4.8	10.1	961
February	14.1	3.3	8.39	721
March	12.5	2.4	4.89	465
April	15.7	5.2	11.5	1,060
May	15.7	4.0	9.14	870
June 1, 3–30	20.7	2.1	9.63	857
July	20.7	4.4	11.3	1,080
August	20.7	2.1	6.85	652
September	11.5	1.2	4.72	435
October 1–28	2.1	.2	.80	69
November 3–30	20.1	5.2	14.2	1,220
December	20.7	6.2	14.2	1,340
The period	.....	.....	.....	9,730

Discharge, in million gallons per day, of Kohala ditch at Nuilii weir, near Kohala, Hawaii, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.8	11.1	9.2	12.8	11.3	6.3	10.6	9.9	9.5	6.8	6.0	9.9
2	12.6	11.4	9.2	12.1	13.1	.....	8.0	10.2	8.2	6.3	6.0	13.0
3	12.6	10.1	8.5	11.2	13.1	4.0	10.6	12.0	8.5	6.3	14.7	12.2
4	11.5	10.6	8.9	11.8	11.3	11.1	12.8	11.8	8.5	6.8	9.1	13.1
5	12.6	10.3	8.9	11.8	11.3	11.1	14.9	11.5	8.2	7.3	13.9	6.8
6	11.5	13.9	8.9	11.3	11.0	9.9	6.8	10.6	8.2	7.3	10.6	6.8
7	9.9	13.3	8.9	11.1	10.6	9.9	6.8	9.2	10.3	6.7	9.5	6.8
8	10.6	11.4	8.9	9.6	10.6	10.0	10.6	9.2	11.1	7.1	8.1	6.8
9	12.3	10.1	8.5	9.5	10.3	10.0	12.8	9.2	10.6	7.4	6.1	7.4
10	13.6	10.3	8.2	11.3	10.3	10.0	12.4	9.2	11.1	14.4	7.4	8.0
11	10.6	10.3	7.9	13.6	10.3	9.5	11.5	9.2	14.0	8.4	7.4	10.6
12	11.5	9.2	7.9	11.7	13.0	9.5	12.8	10.6	11.7	9.0	7.4	13.3
13	5.5	9.9	7.5	11.7	11.7	6.8	10.6	6.8	11.6	8.0	12.3	14.9
14	6.8	10.3	7.5	11.7	11.7	6.8	12.8	6.8	9.6	7.3	13.3	16.0
15	6.8	10.4	7.9	11.7	11.7	6.8	12.8	10.6	8.5	7.3	11.5	6.8
16	13.1	10.6	7.9	11.7	12.8	11.1	10.3	12.3	7.8	6.2	11.6	6.8
17	11.9	12.6	7.9	12.8	12.8	13.9	11.5	12.8	7.5	6.5	7.4	6.8
18	11.8	13.8	8.5	11.7	16.0	10.6	13.6	12.1	14.0	6.8	7.4	6.8
19	10.6	13.3	8.5	12.8	16.9	10.3	12.8	10.7	16.0	7.1	7.4	10.6
20	10.6	13.0	8.5	12.8	14.8	9.1	12.1	9.9	10.2	7.3	11.1	13.3
21	10.4	12.3	10.5	13.6	12.9	10.6	12.2	9.9	8.8	7.3	7.4	14.9
22	10.4	12.3	14.9	12.1	10.3	11.3	14.0	9.2	8.1	7.3	12.8	15.6
23	10.1	11.2	10.1	12.4	10.3	9.9	14.5	9.2	7.2	7.3	13.9	11.7
24	10.1	9.9	9.9	12.2	9.2	11.3	13.0	9.2	7.2	8.2	13.9	13.3
25	10.6	9.9	9.2	12.3	9.2	11.0	10.7	9.2	6.9	8.2	14.9	12.8
26	10.6	13.3	9.2	12.2	12.4	9.9	12.6	9.1	7.5	6.7	14.9	13.1
27	10.6	11.2	9.2	12.8	11.7	9.8	11.5	8.5	6.9	6.8	16.5	12.2
28	9.9	10.6	13.3	13.1	12.4	6.8	11.5	8.5	6.5	7.0	13.8	11.6
29	9.9	.....	13.1	12.3	13.9	6.8	12.1	9.1	7.4	6.6	12.8	11.4
30	9.9	.....	12.1	12.7	11.5	6.8	11.3	10.0	7.4	6.6	11.3	11.1
31	9.9	.....	15.8	.....	10.5	.....	11.3	10.0	.....	6.6	.....	11.1

NOTE.—No discharge June 2.

Monthly discharge of Kohala ditch at Nuilii weir, near Kohala, Hawaii, for 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	13.6	5.5	10.7	1,020
February	13.9	9.2	11.3	971
March	15.8	7.5	9.53	907
April	13.6	9.5	12.0	1,100
May	16.9	9.2	11.9	1,130
June 1, 3–30	13.9	4.0	9.34	831
July	14.9	6.8	11.7	1,110
August	12.8	6.8	9.89	941
September	16.0	6.5	9.30	856
October	14.4	6.2	7.38	702
November	16.5	6.0	10.7	985
December	15.6	6.8	10.8	1,030
The period (364 days)	15.8	4.0	10.4	11,600

KEHENA DITCH AT HONOKANE MAUKA, NEAR NORTH KOHALA, HAWAII.

Location of weirs.—On 22 streams in Kehena district, beginning at head of Honokane Gulch and extending northeast about 8 miles in Kohala Mountains, at elevation of 4,200 to 3,000 feet.

Records available.—April 1, 1912, to March 31, 1913.

Gages.—Vertical staffs; read once daily.

Discharge.—Determined by means of sharp-crested weirs with end contractions.

Diversion.—Ditch diverts most of the water above 2,000-foot contour.

Cooperation.—Daily-discharge record furnished by Kohala Ditch Co. (Ltd.).

Combined daily discharge, in million gallons per day (weirs 1 to 22), of 22 streams supplying Kehena ditch at Honokane Mauka, North Kohala, Hawaii, Apr. 1, 1912, to Mar. 31, 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	34.23	5.23	0.83	2.96	0.18	0.76	7.24	9.95	25.78	2.47	0.50	0.89
2	18.65	15.10	.57	4.03	.19	33.71	2.25	2.73	7.41	1.86	.63	.71
3	54.24	7.62	.28	5.20	.23	84.81	4.99	1.87	2.90	1.50	.46	.57
4	57.50	10.81	.11	3.72	.17	170.34	3.31	1.11	2.00	2.76	.31	.43
5	25.03	19.96	.09	5.37	.15	9.33	.93	1.77	1.55	1.56	.30	.33
6	14.76	26.53	.03	3.77	.14	3.80	.31	1.68	1.26	1.04	1.22	.29
7	119.37	5.36	.03	28.23	1.29	23.61	.17	1.24	3.05	.82	5.09	.24
8	35.19	21.26	1.45	4.36	.87	5.24	.11	1.10	10.84	1.06	2.33	.19
9	41.60	11.77	16.20	11.68	22.99	2.34	.10	21.51	4.34	2.06	1.07	.18
10	28.50	5.06	11.32	3.05	20.62	1.12	.98	105.51	22.16	9.28	.68	.17
11	16.86	2.19	20.22	4.57	10.50	.77	.40	26.86	3.29	3.54	.42	.17
12	19.93	.97	6.36	3.71	18.50	.62	.22	11.95	1.93	2.05	.28	.17
13	24.98	.99	10.68	1.60	19.83	.49	.16	49.26	1.53	10.41	.16	.17
14	9.39	.92	4.78	9.04	16.82	.52	7.20	7.94	1.50	27.97	.51	.14
15	12.18	.53	3.38	2.02	27.82	.54	3.48	3.03	1.28	20.71	2.22	.14
16	6.64	.53	22.26	.73	5.10	5.90	1.48	41.31	.84	5.10	1.06	.13
17	13.27	2.39	13.94	1.42	3.04	2.50	2.86	93.77	.74	2.36	5.86	2.82
18	3.82	1.26	6.58	.92	2.42	.78	1.25	70.51	.92	1.54	7.45	2.62
19	2.04	6.05	23.12	.55	7.69	.51	7.58	39.60	1.09	.96	24.81	8.20
20	1.44	6.11	8.87	.37	2.64	.89	1.55	12.19	6.52	.74	7.87	3.54
21	3.38	18.91	13.22	.24	1.54	5.42	3.75	13.50	2.28	.59	5.86	8.42
22	5.06	3.89	4.09	.64	.75	1.50	1.34	9.02	12.86	.56	6.38	26.49
23	6.94	1.54	2.97	4.52	.28	.59	25.67	12.20	46.28	.48	3.51	7.11
24	27.08	1.14	22.09	32.66	.15	.33	33.89	5.83	21.87	.42	1.27	3.81
25	13.86	5.86	4.30	3.51	.07	.05	6.37	3.06	5.67	.38	3.99	1.23
26	31.01	1.65	1.77	2.79	.03	.05	3.99	1.72	10.78	.28	11.18	1.07
27	13.25	14.35	5.35	3.33	.14	.05	62.69	1.52	5.08	.25	4.60	1.46
28	7.23	10.02	1.63	1.46	4.90	.03	19.43	1.32	2.89	.31	2.01	37.46
29	5.95	3.93	1.17	.78	3.96	.03	23.46	7.67	6.09	.23	.....	20.86
30	12.66	4.70	7.44	.44	1.27	13.30	6.39	2.57	6.14	.15	.....	7.00
31	.....	1.84	.....	.26	.70	.....	10.56	.....	6.30	.12	.....	18.24

Combined monthly discharge of weirs Nos. 1 to 22, Kehena ditch, at Honokane Mauka, North Kohala, Hawaii, Apr. 1, 1912, to Mar. 31, 1913.

Month.	Discharge in million gallons per day.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	119.37	1.44	22.2	2,040
May	26.53	.53	7.05	671
June	23.12	.03	7.17	660
July	32.66	.24	4.77	454
August	27.82	.03	5.65	538
September	170.34	.03	12.3	1,130
October	62.89	.10	7.88	750
November	105.51	1.10	18.8	1,730
December	46.28	.74	7.33	697
January	27.97	.12	3.32	316
February	24.81	.16	3.65	314
March	37.46	.13	5.01	477
The year	170.34	.03	8.74	9,780

MISCELLANEOUS MEASUREMENTS.

Measurements of streams on the island of Hawaii at points other than regular gaging stations are listed below:

Miscellaneous discharge measurements on Hawaii for 1913.

Date.	Stream.	Locality.	Gage height.	Discharge.
			Feet.	*Sec.-ft.*
Apr. 14	Pukihae	Near Hilo	−4.51	27.5
May 28	do	do	−4.76	11.8
June 3	do	do	−4.50	29.0
July 10	do	do	−4.52	28.1
Apr. 14	Pohakunanaka	do	−3.35	5.60
May 28	do	do	−3.42	3.10
June 3	do	do	−3.27	7.85
July 10	do	do	−3.33	4.90
June 21	Upper Springs Hilo Water Supply	Piihonua, near Hilo	.....	2.09
24	Small Springs	do	.....	.74
July 12	do	do	.62	.75
Mar. 20	Hanawai	Near Papaikou	.36	9.9
June 28	do	do	.45	17.3
July 9	do	do	.51	28.0
June 27	Aleamai	do	.....	16.6
July 9	do	do	−3.25	16.2
June 28	Large spring	Piihonua, near Hilo	.....	2.54
May 8	Maili	Near Hilo	− .15	33.5
July 8	do	do	− .44	10.5
May 10	Waipahoehoe	Near Papaikou	−3.10	23.7
July 8	do	do	−2.40	62.6
May 10	Kapue	do	−4.24	30.6
July 9	do	do	3.02	52.8
11	Makoewai	Near Honomu	.....	6.94
11	Honomu	do	.....	10.8
11	Kapahehe	do	− .69	12.4
12	Waste from large spring	Piihonua, near Hilo	.36	.19
Jan. 8	Kawainui	Near Pepeekeo	4.00	491
Mar. 20	do	do	.98	16
June 27	do	do	(a)	27
July 9	do	do	(a)	48
Jan. 26	Waipio	Below Waima	.35	55
26	do	Below Wolawa	.79	19

[a] Staff gage washed out by flood.

RAIN GAGING.

The rainfall of the Hawaiian Islands is extremely variable, ranging from a few inches at several low-level, leeward localities to more than 600 inches per annum, usually at elevations above 2,000 feet and on the windward sides of the islands. Valleys lying on the same sides of the islands and within a few miles of each other may have a variation in mean annual precipitation of several hundred per cent. The rainfall may also vary greatly in the same valley for different elevations. As a rule the zones of heaviest precipitation are on the windward sides of the islands, 2,000 to 3,000 feet above sea level.

Generally the daily rain gages maintained by the United States Weather Bureau are located at low levels. Lack of funds and the absence of inhabitants at high-level localities have prevented the maintenance of Weather Bureau stations at high levels, although in a number of cases daily records are furnished that bureau by occupants and caretakers of mountain houses and ranches. The data furnished by the Weather Bureau are therefore generally of little value in their relation to stream run-off.

When high levels have been accessible and funds available high-level rain gages, which are read monthly and bimonthly, have been established by this office and some valuable records obtained. To determine the precipitation of the Territory accurately would require the installation of thousands of gages and the construction of hundreds of miles of trails.

Acknowledgment for cooperation in furnishing rainfall data is due the following: Kauai—Kekaha Sugar Co., Makee Sugar Co., Hawaiian Sugar Co., Grove Farm Plantation, W. F. Sanborn of Princeville Ranch, Kauai Electric Co., and J. McClellan—Oahu, C. C. Bitting, F. Meyer, and Hawaii Preserving Co.; Maui—Wailuku Sugar Co., Honolulu Ranch, Hawaiian Commercial & Sugar Co., Maui Board of Supervisors, Pioneer Mill Co., and Olowalu Sugar Co.; Hawaii—Hawaii Mill Co., P. W. P. Bluett, W. S. May, C. F. Clark, C. R. Willard, Alex. Valentine, Honokaa Sugar Co., Pacific Sugar Mill, Hawaiian Irrigation Co., and Kukaiau Ranch Co.

The tables on pages 180–185 show the precipitation at stations maintained by the Geological Survey and precipitation data furnished from private sources which are not included in United States Weather Bureau records, to which those interested in further data are referred.

Rainfall stations in Hawaii.

KAUAI.

1. Kokee, on mesa one-half mile above Knudsen's camp near head of Kokee Stream and about 19 miles north of Waimea; 3,550 feet above sea level.
2. Puu Lua, near wagon road from Kekaha to Halemanu, about 12 miles north of Waimea; 3,500 feet above sea level.
3. Lehuamakanoi, about 22 miles by road and trail north of Waimea; 3,932 feet above sea level.
4. Paukahana, about 21 miles north of Waimea by road and trail; 3,723 feet above sea level.
5. Waiakoali, about 22 miles by road via Halemanu north of Waimea; 3,450 feet above sea level.
6. Kilohana, near Alakai swamp, about 23 miles by road and trail north-northeast of Waimea; 4,023 feet above sea level.
7. Mohihi, on ridge at head of Mohihi Valley and about 23 miles by road and trail northeast of Waimea; 3,500 feet above sea level.
8. Mohihi-Koaie divide, on ridge about 24 miles by road and trail north of Waimea; 3,950 feet above sea level.
9. Waialae, near Kaholuamanu; 14 miles by road and trail north of Waimea, near Waialae gaging station; 3,600 feet above sea level.
10. Hukipo, 3 miles northwest of Waimea; 400 feet above sea level; records furnished by Kekaha Sugar Co.
11. Pali trail, one-half mile mauka of Kekaha ditch where trail crosses and about 2 miles mauka from Waimea; 850 feet above sea level; records furnished by Kekaha Sugar Co.
12. Camp No. 7, about 2 miles northeast of Waimea; 150 feet above sea level; records furnished by Hawaiian Sugar Co.
13. Waimea, in Mr. J. McClellan's yard; 10 feet above sea level; Mr. McClellan aids in obtaining record.

14. Kaholuamanu, about 12 miles by road and trail northeast of Waimea; 3,650 feet above sea level.
15. Kahana, near Halekua camp, on ridge about 16 miles by road and trail via Kaholuamanue from Waimea; 3,750 feet above sea level.
16. Keanakua, near Halekua camp, on ridge about 16 miles by road and trail north-northeast of Waimea; 4,450 feet above sea level.
17. Olokele mauka, on ridge on left side of Olokele Stream above intake of Olokele ditch, and about 18 miles by road and trail from Waimea; 2,100 feet above sea level; records furnished by Hawaiian Sugar Co.
18. Waialeale, on summit of ridge at headwaters of Hanapepe, Wainiha, Hanalei, and Olokele streams, and North and South Forks of Wailua River; about 25 miles by road and trail northeast of Waimea; 5,075 feet above sea level.
19. Camp No. 2, about 2 miles northwest of Hanapepe and 7 miles southeast of Waimea; 250 feet above sea level; records furnished by Hawaiian Sugar Co.
20. Hanapepe Valley, on left bank of Hanapepe ditch, 3 miles above Koula, and about 8 miles north of Eleele; 530 feet above sea level; records furnished by Hawaiian Sugar Co.
21. Hiloa-Manawaiopuna divide, on ridge between east and west branches of Hanapepe Stream, about 10 miles northeast of Eleele; 2,080 feet above sea level.
22. Aakukui, near plantation camp, about 5 miles southwest of Lihue; 350 feet above sea level; records furnished by Grove farm.
23. Waiahi, on South Wailua River, near Lihue Electric Co.'s power plant, 7 miles from Lihue; 600 feet above sea level.
24. Hanahanapuni, on ridge near Kauai Electric Co.'s power line, about 10 miles northwest of Lihue; 911 feet above sea level.
25. North Wailua, near Waialeale Pali, in North Kailua Valley, about 15 miles by road and trail northwest of Lihue; 1,250 feet above sea level.
26. Pohakupili, on top of narrow ridge about 6 miles west of Kealia; 2,590 feet above sea level.
27. Puu Eu, on ridge about 6½ miles west of Kealia; 2,748 feet above sea level.
28. Kaneha, at gate tender's house near the mauka Kaneha reservoir, and about 5 miles northwest of Kealia; 800 feet above sea level; records furnished by Makee Sugar Co.
29. Summit Camp (Wainiha ridge), Hanalei; about 30 feet southwest of house at Summit Camp on power line; 6 miles from Kapaka; 1,900 feet above sea level; gage read by employee of Kauai Electric Co.
30. Kapaka, at Lineman's camp, about 50 feet north of house, and 5 miles south of Hanalei; 635 feet above sea level; gage read by employee of Kauai Electric Co.
31. About 40 feet north of Sanborn's residence, 2 miles from Hanalei; 105 feet above sea level; records furnished by Princeville ranch.
32. About 50 feet below Kauai Electric Co.'s power house, at tailrace, 7 miles west of Hanalei; 125 feet above sea level; records furnished by Kauai Electric Co.
33. Intake of Wainiha Power Co.'s canal, 6 miles back of Hanalei; 700 feet above sea level; records furnished by Kauai Electric Co.

OAHU.

1. Nuuanu Pali, on the water reservation, near the Pali road, about 200 yards toward Honolulu from top of the Pali; 1,200 feet above sea level.
2. Summit of Konahuanui, southeast of Nuuanu Pali, about 6 miles in air line northeast of Honolulu; 3,100 feet above sea level.
3. Near summit of Mount Olympus, back of Manoa Valley, about 6½ miles in air line northeast of Honolulu; 2,400 feet above sea level.
4. Waiomao, on the property of C. C. Bitting, lot No. 8, Palolo Valley, Honolulu; 600 feet above sea level; records furnished by C. C. Bitting.

5. Kaau crater, on trail from Mount Olympus, a short distance before it leads down the ridge into Palolo Valley and about 3½ miles north of Kaimuki car line; 1,700 feet above sea level.
6. On the ridge between the Waiahole and Waiawa portals of the Waiahole Water Co.'s tunnel, near Waiahole, Waikane, Oahu; 2,150 feet above sea level.
7. Makaha, near Waianae, on property of Waianae plantation; 1,300 feet above sea level; records furnished by F. Meyer, manager Waianae plantation.
8. About 150 yards downstream on left bank of North Fork of Kaukonahua stream from Waialua Agricultural Co.'s ditch intake, on trail 8 miles north of Wahiawa; 1,200 feet above sea level.
9. Near the office of the Hawaiian Preserving Co., Wahiawa; 940 feet above sea level; records are furnished by Hawaiian Preserving Co.

MAUI.

1. In H. B. Penhallow's yard, Wailuku; 390 feet above sea level; records furnished by Wailuku Sugar Co.
2. Yard at Wailuku Sugar Co.'s office, Wailuku; 175 feet above sea level; records furnished by Wailuku Sugar Co.
3. Right bank of Iao Stream at the gaging station, 20 feet from the north anchorage of the cable; 3 miles west of Wailuku; 830 feet above sea level.
4. Iao Valley on small plateau or tableland between north and south branches of Iao Stream, about 1 mile above the junction; about 4 miles west of Wailuku; 1,500 feet above sea level.
5. About 1,000 feet below small cave in Iao Valley, on ridge between north and south branches of Iao Stream; about 5½ miles west of Wailuku; 1,720 feet above sea level.
6. Waiehu, at T. Burlem's house on old Spreckels ditch just south of South Waiehu Gulch, 2 miles northwest of Wailuku; 200 feet above sea level; records furnished by Hawaiian Commercial & Sugar Co.
7. Waihee, on roof of building formerly used as plantation office; 3½ miles from Wailuku; 125 feet above sea level; records furnished by Wailuku Sugar Co.
8. Waihee Gulch, on right bank of the stream, about 100 feet below lower development tunnel; about 5½ miles from mouth of gulch and 3 miles above intake of Waihee canal and the Waihee gaging station; 1,500 feet above sea level.
9. Rim of extinct crater of Mount Eke; 14 miles by trail from Honokahau; 4,500 feet above sea level.
10. Honokahau Gulch at ditchman's house on left bank of stream, 150 feet below ditch intake; about 8 miles from Honokahau; 800 feet above sea level; records furnished by Honolua Ranch Co.
11. Camp on ridge between Honokahau and Kahakuloa gulches beside trail leading to top of Mount Eke; about 12 miles from Honokahau; 2,300 feet above sea level.
12. Honokahau ditch about one-half mile south of Honokahua Gulch and about 4 miles from Honokahau; 760 feet above sea level; records furnished by Honolua Ranch Co.
13. Honokawai Gulch at junction with Amalu Stream; on trestle supporting Honokawai flume about 1,000 feet below intake; about 3½ miles from Kaanapali and 7½ miles from Lahaina; 1,500 feet above sea level; records furnished by Pioneer Mill Co.
14. West slope of Puu Kukui, about one-half mile south of Honokawai Gulch; about 4½ miles east of Kaanapali and 8½ miles from Lahaina; 2,500 feet above sea level; records furnished by Pioneer Mill Co.
15. West slope of Puu Kukui at top of left bank of Honokawai Gulch; about 6 miles east of Kaanapali and 10 miles from Lahaina; 5,000 feet above sea level; records furnished by the Pioneer Mill Co.

16. Olowalu Sugar Co.'s mill in Olowalu; 10 feet above sea level; records furnished by Olowalu Sugar Co.
17. Olowalu Gulch (mauka) on right bank of Olowalu Stream about 3½ miles north of Olowalu; 600 feet above sea level; records furnished by Olowalu Sugar Co.
18. Waikapu Gulch, on left bank of the South Branch of Waikapu Stream, about 4 miles by trail from Waikapu and 6 miles from Wailuku; 1,535 feet above sea level.
19. Olinda, on Kula pipe line; 4 miles east of Makawao; 4,000 feet above sea level; records furnished by Board of Supervisors, County of Maui.
20. Waikamoi Gulch, on Kula pipe line at reservoir; 3 miles from Olinda and 7 miles from Makawao; 4,200 feet above sea level; records furnished by Board of Supervisors, County of Maui.
21. Puohakamoa, on Kula pipe line about 1,000 feet below intake at Puohakamoa Gulch; 4 miles east of Olinda and 8 miles from Makawao; 4,300 feet above sea level; records furnished by Board of Supervisors, County of Maui.
22. Camp No. 1 of Hawaiian Commercial & Sugar Co., near Spreckelsville, 5 miles east of Kahului; 50 feet above sea level; records furnished by Hawaiian Commercial & Sugar Co.
23. Camp No. 7 of Hawaiian Commercial & Sugar Co., near Kihei, about 5 miles south of Puunene; 50 feet above sea level; records furnished by Hawaiian Commercial & Sugar Co.
24. Puunene, at Hawaiian Commercial & Sugar Co.'s office; 50 feet above sea level; records furnished by Hawaiian Commercial & Sugar Co.

HAWAII.

1. Near flume at camp No. 8 of Waiakea plantation, near Waiakea; 1,500 feet above sea level; records furnished by Waiakea Plantation Co.
2. Camp No. 6, at plantation camp back of Waiakea; 800 feet above sea level; records furnished by Waiakea plantation.
3. United States Engineer's office at Hilo breakwater, Hilo; 15 feet above sea level; records furnished by United States Engineers' office.
4. Piihonua, at office and store of Hawaii Mill Co., near Hilo; 915 feet above sea level; records furnished by Hawaii Mill Co.
5. Hilo, in rear of J. T. Lewis's residence, Waianuenue Street; 60 feet above sea level.
6. Station No. 1, about 50 feet in rear of Alex. Valentine's house at Wainaku camp of Hilo Sugar Co.; 200 feet above sea level; records June 30 to November 30 furnished by Alex. Valentine, of Hilo Sugar Co.
7. Station No. 2, at Antone Mogordo's blacksmith shop near Kaiwiki road, and about 1 mile above the Wainaku camp of the Hilo Sugar Co.; 1,000 feet above sea level.
8. Station No. 3, near Kaiwiki, on trail from mauka end of Kaiwiki road to 2,700-foot camp, and about 600 feet above end of road; at lower edge of timber; 1,500 feet above sea level.
9. Station No. 4, on trail from mauka end of Kaiwiki road to 2,700-foot camp, in timber belt; 2,000 feet above sea level.
10. Station No. 5, about 3½ miles above Kaiwiki,[1] near Hilo; 2,650 feet above sea level.
11. Station No. 6, at camp, on east slope of Mauna Kea, in heavy timber belt; 3,000 feet above sea level.
12. Station No. 7, on east slope of Mauna Kea, in heavy timber belt; 3,500 feet above sea level.

[1] Gage originally located at elevation of 2,500 feet by H. R. Schulz; later moved to elevation of 2,650 feet; thought to be 2,500 feet by C. H. Pierce, July 1, 1911.

13. Station No. 8, on east slope of Mauna Kea, in heavy timber belt; 4,000 feet above sea level.
14. Station No. 9, on east slope of Mauna Kea, in heavy timber belt; 4,500 feet above sea level.
15. Station No. 10, on east slope of Mauna Kea, in heavy timber belt; 5,000 feet above sea level.
16. Umikoa, on property of Kukaiau Ranch Co. (Ltd.), near ranch house; 3,400 feet above sea level; records furnished by Kukaiau Ranch Co. (Ltd.).
17. Puukihe, on top of Kihe hill on the side of Mauna Kea, about 10 miles south of Kukaiau; 7,822 feet above sea level; records furnished by Kukaiau Ranch Co. (Ltd.).
18. Reservoir No. 13, on land of Honokaa Sugar Co., near Honokaa; 1,480 feet above sea level; records furnished by the civil engineers' office of Honokaa Sugar Co. and Pacific Sugar Mill.
19. Near Honokaa, at office of civil engineers for Pacific Sugar Mill and Honokaa Sugar Co.; 1,120 feet above sea level; records furnished by civil engineers.
20. Ahualoa homesteads, at ditch tender's house, near the Parker ranch, Honokaa; 2,551 feet above sea level; records furnished by civil engineers' office of Honokaa Sugar Co. and Pacific Sugar Mill.
21. Waima, in Waipio Valley along the line of lower Hamakua ditch, near Kukuihaele; 980 feet above sea level; records furnished by Hawaiian Irrigation Co.
22. Lower Koiawe, near the line of the lower Hamakua ditch in Waipio Valley near Kukuihaele; 1,000 feet above sea level; records furnished by Hawaiian Irrigation Co.
23. Upper Koiawe, along the line of the upper Hamakua ditch, Waipio Valley, near Kukuihaele; 3,350 feet above sea level; records furnished by Hawaiian Irrigation Co.
24. Alakahi-Waipio, in Waipio Valley, Kohala Mountains, along the line of the lower Hamakua ditch, near Kukuihaele; 1,030 feet above sea level; records furnished by Hawaiian Sugar Co.
25. Alakahi-Waipio, in Waipio Valley, Kohala Mountains, near the line of the upper Hamakua ditch; 3,870 feet above sea level; records furnished by Hawaiian Irrigation Co.
26. Lower Kawainui, in Waipio Valley, near the line of the lower Hamakua ditch, near Kukuihaele; 1,040 feet above sea level; records furnished by Hawaiian Irrigation Co.
27. Upper Kawainui, in the Kohala Mountains, near the line of the upper Hamakua ditch, near Kukuihaele; 4,080 feet above sea level; records furnished by Hawaiian Irrigation Co.
28. Honokane mauka; in the Kohala Mountains, near the intake of the Kehena ditch, near Kohala; 3,800 feet above sea level; records furnished by Kohala Ditch Co.
29. Kaauhuhu, on property of W. S. May, about 3 miles northwest of Hawi; 1,400 feet above sea level; records furnished by W. S. May.

Precipitation and estimated evaporation (in inches) at rainfall stations maintained during 1913.

Kauai.

Station.	Records available.	Gage.	Readings.	Precipitation.												Estimated evaporation.
				Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	For 1913.[a]	
1. Kokee	June 6, 1910, to Dec. 31, 1913	8-inch 2:1	Monthly													48.30	6
2. Puu Lua	June 5, 1910, to Dec. 31, 1913	do	do													45.66	6
3. Lehuamakanoi	June 18, 1910, to Dec. 31, 1913	13-inch, 5:1	Bimonthly													134.8	6
4. Paukahana	June 4, 1910, to Dec. 31, 1913	8-inch, 2:1	Monthly													77.0	6
5. Waiakoali	do	do	do													76.8	6
6. Kilohana	June 18, 1910, to Dec. 31, 1913	13-inch, 5:1	Irregular													216.0	6
7. Mohihi	June 21, 1910, to Dec. 31, 1913	8-inch, 2:1	do													83.8	6
8. Mohihi-Koaie divide	June 24, 1910, to Dec. 31, 1913	do	Bimonthly													88.0	6
9. Waialae	July 31, 1910, to Dec. 31, 1913	do	Monthly													89.2	6
10. Hukipo	January, 1911, to Dec. 31, 1913	Owned by Kekaha Sugar Co.	Probably monthly.	1.12	1.21	0	0	3.19	2.17	1.48	0.45	0.65	3.84	2.80	0	18.91	2
11. Pali trail	June 1, 1911, to Dec. 31, 1913	do	do	1.24	2.10	0	0	4.01	2.57	.78	0	1.59	5.14	.50	0	19.93	2
12. Camp No. 7	Jan. 1, 1904, to Dec. 31, 1913	Owned by Hawaiian Sugar Co.	Probably daily.	.80	1.68	0	0	5.36	2.70	.14	.41	1.12	5.90	2.23	0	22.34	2
13. Waimea (see table, p. 184).	Jan. 1 to Dec. 31, 1913	Small weather bureau gauge, 1:10.	Daily	1.20	1.96	0	.21	4.51	2.95	1.23	.37	.78	6.10	2.18	.09	23.58	2
14. Kaholuamanu	Mar. 11 to Dec. 31, 1913	8-inch, 2:1	Monthly													[b] 52.88	4
15. Kahana	Aug. 1, 1910, to Dec. 31, 1913	do	Irregular													84.70	6
16. Keanakua	Sept. 6, 1910, to Dec. 31, 1913	do	do													101.40	6
17. Olokele mauka	Apr. 1, 1911, to Dec. 31, 1913	Owned by Hawaiian Sugar Co.	Probably monthly.	15.25	5.10	5.06	14.28	11.24	10.53	7.98	10.25	4.76	13.44	27.35	.74	131.98	6
18. Waialeale	Sept. 9, 1910, to Dec. 31, 1913	13-inch, 5:1	Irregular													453.0	6
19. Camp No. 2	January, 1905, to Dec. 31, 1913	Owned by Hawaiian Sugar Co.	Probably daily.	1.07	2.06	0	.15	5.75	6.17	.42	1.17	.63	5.37	4.23	0	29.02	2
20. Hanapepe Valley (see table, p. 184).	Jan. 1, 1905, to Dec. 31, 1913	do	Daily	9.08	3.54	5.05	11.26	9.42	10.92	7.73	10.44	3.66	14.18	25.61	.69	113.58	2
21. Hiloa - Manawaiopuna divide.	Aug. 24, 1910, to Dec. 31, 1913	8-inch, 2:1	Monthly	18.90	6.40	9.80	25.20	15.30	17.80	16.20	15.40	6.60	18.40	43.40	8.40	207.80	6
22. Aakukui	June, 1909, to Dec. 31, 1913	Owned by Grove Farm.	Probably daily.	3.98	6.43	5.08	4.28	5.97	8.21	2.30	2.27	2.42	6.15	11.80	1.55	66.44	6
23. Waiahi	Aug. 8, 1910, to Dec. 31, 1913	8-inch, 2:1	Monthly	6.16	4.00	6.14	8.10	10.16	10.16	2.06	2.10	(c)	[c]2.16	22.06	2.04	81.14	6
24. Hanahanapuni	do	do	do	4.08	6.18	6.04	8.00	8.12	12.00	2.18	6.02	4.16	8.00	20.40	6.04	97.22	6
25. North Wailua	July 26, 1912, to Dec. 14, 1913	13-inch, 5:1	Quarterly													265.2	6
26. Pohakupili	July 25, 1910, to Dec. 31, 1913	do	do													124.7	6
27. Puu Eu	do	do	Irregular													210.2	6
28. Kaneha	Jan. 1 to Dec. 31, 1913	Owned by Makee Sugar Co.	Probably daily.	5.85	5.80	10.85	5.15	10.35	8.90	4.75	3.35	3.35	6.40	14.40	7.70	88.85	2

29. Summit Camp, Hanalei (see table, p. 184)	September, 1910, to Dec. 31, 1913		Daily	17.92	8.93	15.49	17.04	21.47	14.47	12.27	11.91	8.95	13.80	31.16	7.81	183.22	2
30. Kapaka (see table, p. 184)	do		do	9.82	7.84	11.57	7.43	10.46	8.53	9.03	7.67	5.08	6.93	19.10	9.49	114.95	2
31. Sanborn's residence, Hanalei	March, 1910, to Dec. 31, 1913		do	4.46	6.39	5.33	5.71	6.28	4.69	5.13	5.00	2.54	6.18	12.12	6.63	72.46	2
32. Power house near Wainiha (see table, p. 184)	February, 1907, to Dec. 31, 1913		do	8.39	10.50	12.41	10.51	5.22	5.44	6.92	7.21	3.15	5.22	17.34	8.65	102.96	2
33. Intake of Wainiha Canal (see table, p. 184)	Feb. 1, 1907, to Dec. 31, 1913		do	6.91	6.01	27.99	13.68	7.25	10.22	11.83	9.54	5.20	9.18	28.03	8.81	146.65	2
Oahu.																	
1. Nuuanu, Pali	Sept. 23, 1910, to Dec. 31, 1913	8-inch, 2:1	Monthly	10.30	7.92	7.40	5.70	9.60	12.90	3.00	9.20	5.20	3.10	15.20	14.60	110.12	6
2. Mount Konahuanui	Oct. 27, 1910, to Dec. 31, 1913	do	do	7.0	8.6	8.4	5.4	9.4	12.6	3.6	8.4	4.2	5.4	10.6	11.2	100.8	6
3. Mount Olympus	Jan. 1 to Dec. 31, 1913	do	do	4.6	6.0	7.2	2.4	7.4	8.0	2.4	5.0	3.0	4.8	9.0	4.4	70.2	6
4. Waiomao	Oct. 1, 1910, to July 31, 1913	1:10	Weekly	2.88	4.37	5.56	7.71	5.35	4.37	2.73	.....	.....	.....	.....	.....	[d]33.97	1
5. Kaau crater	Jan. 1 to Dec. 31, 1913	8-inch, 2:1	Monthly	5.0	8.1	8.0	9.0	5.0	8.0	3.4	6.8	3.0	5.2	18.0	16.8	102.3	6
6. Waiawa-Waiahole ridge	Dec. 5, 1910, to Dec. 31, 1913	do	do	16.70	8.64	9.00	9.00	12.50	13.60	5.80	10.50	7.50	12.25	23.50	16.10	151.09	6
7. Makaha near Waianae (see table, p. 184)	Aug. 1, 1912, to Dec. 31, 1913	1:10	Daily	5.95	3.43	6.26	3.94	13.62	6.59	1.39	4.02	4.22	8.80	7.78	12.41	80.41	2
8. Waialua Agricultural Co.'s intake	May 30 to Dec. 31, 1913	8-inch, 2:1	Monthly	.....	.....	.....	.....	.....	[e]18.6	[f]3.6	11.9	8.6	12.8	39.6	14.0	113.1	4
9. Hawaiian Preserving Co. (see table, p. 184)	Mar. 1 to Dec. 31, 1913	1:10	Daily	.....	.....	2.32	4.00	5.32	0.	2.36	3.57	3.51	4.76	5.78	.82	34.44	2

[a] Includes estimated evaporation.

[b] Obtained from irregular monthly readings as follows:

	Inches.
Mar. 11 to Apr. 11	2.00
May 8	3.00
June 9	9.00
July 19	3.20
Aug. 7	.80
Sept. 11	4.40
Oct. 12	5.00
Nov.	4.60
Dec. 2	14.20
Dec. 31	2.68
	48.88
Estimated evaporation	4.00
	52.88

[c] Hole in container; no water. New gage installed Oct. 15.

[d] Precipitation during part of year 1913 for which records are available.

[e] Includes rainfall to July 11.

[f] Record begins July 12.

Precipitation and estimated evaporation (in inches) at rainfall stations maintained during 1913—Continued.

Maui.

Station.	Records available.	Gage.	Readings.	Precipitation.												Estimated evaporation.
				Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	For 1913.[a]	
1. Penhallow's yard, Wailuku.	November, 1896, to Dec. 31, 1913	1:10	Daily	0.63	7.23	1.17	2.40	5.66	0.59	0.22	2.01	0.58	1.25	3.82	4.20	31.76	2
2. Wailuku	May, 1887, to Dec. 31, 1913	1:10	do	.37	5.51	1.17	2.38	6.32	.49	.11	1.42	.48	1.06	3.31	3.00	27.62	2
3. Iao Valley, near Wailuku.	Apr. 12, 1911, to Dec. 31, 1913	8-inch, 2:1	Irregular													[b] 79.0	6
4. Iao Valley tableland	do	do	do													[b]114.4	6
5. Cave in Iao Valley	Nov. 5, 1910, to Dec. 31, 1913	do	do													[b]131.9	6
6. Waiehu	January, 1910, to Dec. 31, 1913	1:10	Daily	.45	5.57	1.33	2.39	6.52	1.41	.48	1.40	.91	1.00	2.97	4.93	31.36	2
7. Waihee	Jan. 1 to Dec. 31, 1913	1:10	do	.62	2.54	1.70	2.48	5.21	1.30	.27	1.43	.61	.60	3.03	4.37	25.16	1
8. Waihee Gulch	Nov. 4, 1910, to Dec. 31, 1913	10:1	Irregular													238.2	6
9. Mount Eke	Mar. 10 to Dec. 31, 1913	8-inch, 2:1	Monthly													[b]218.7	6
10. Honokahau Gulch	February, 1907, to Dec. 31, 1913	1:10	Daily	3.19	12.88	6.90	17.72	9.83	9.48	5.06	7.77	3.00	5.57	26.03	15.18	125.61	3
11. Ridge at Honokahau.	Mar. 10 to Dec. 26, 1913	8-inch, 2:1	Monthly													[b] 93.7	6
12. Honokahua Gulch	Jan. 1 to Dec. 31, 1913	1:10	Daily	1.72	4.57	4.07	9.67	7.09	3.82	2.16	3.57	1.53	2.10	10.59	4.50	57.39	2
13. Honokawai Gulch	Oct. 17, 1911, to Dec. 31, 1913	8-inch, 2:1	Monthly	7.38	8.08	6.78	17.92	8.37	7.18	4.95	6.68	3.10	6.00	20.98	9.36	112.78	6
14. Puu Kukui, near Lahaina.	Oct. 13, 1911, to Dec. 31, 1913	13-inch, 5:1	do	14.0	6.0	12.0	16.0	9.5	7.03	9.0	6.5	3.2	6.0	21.5	7.5	124.23	6
15. Puu Kukui, near Kaanapali.	do	do	do	38.0	22.0	31.0	50.0	16.0	37.0	18.0	20.0	7.0	13.5	55.0	26.5	337.0	3
16. Olowalu	Jan. 1, 1907, to Dec. 31, 1913	1:10	Daily	.90	5.24	.05	0	11.75	.40	0	1.17	0	.72	.50	.27	22.00	1
17. Olowalu Gulch	Nov. 1, 1911, to Dec. 31, 1913	8-inch, 2:1	Monthly													120.75	6
18. Waikapu Gulch	Nov. 3, 1910, to Dec. 31, 1913	do	Irregular													111.9	6
19. Olinda	Sept. 26, 1910, to Nov. 21, 1913	1:10	Daily	.86	2.46	1.55	3.47	1.97	1.78	.52	1.43	2.32	4.57	12.29		[c] 35.22	2
20. Waikamoi Gulch	Oct. 12, 1910, to Dec. 31, 1913	1:10	do	5.10	13.03	8.10	53.35	9.68	13.70	13.33	14.29	19.17	14.35	45.54	16.09	227.73	2
21. Puohakamoa	May 1, 1911, to Dec. 31, 1913	8-inch, 2:1	do	10.40	10.60	8.44	47.80	9.57	14.19	7.78	13.11	18.18	14.61	41.69	16.14	214.5	2
22. Camp No. 1	Jan. 1 to Dec. 31, 1913	1:10	do	.10	2.16	.88	2.17	5.46	.17	0	1.50	.60	.63	3.52	3.72	22.91	2
23. Camp No. 7	Jan. 1, 1910, to Dec. 31, 1911; Jan. 1 to Dec. 31, 1913.	1:10	do	0	2.36	.06	0	5.19	.07	0	.25	0	1.06	.31	1.01	11.31	1
24. Puunene	Jan. 1 to Dec. 31, 1913	1:10	do	.13	2.15	.16	.92	5.60	.22	0	1.26	.50	.47	2.27	2.81	17.49	1

1. Camp No. 8, Waiakea.	June 1 to Dec. 31, 1913		Monthly						17.00	9.75	10.75	5.75	6.75	44.50	11.75	[b]109.25	3
2. Camp No. 6, Waiakea.	July 1 to Dec. 31, 1913		do							11.03	12.60	6.12	6.60	39.01	9.45	[b] 90.8	6
3. Hilo breakwater	July 20, 1911, to Dec. 31, 1913	8-inch, 2:1	do	28.70	4.60	[d]0.30	10.70	6.60	9.60	5.80	6.50	6.00	5.60	30.00	8.40	127.8	5
4. Piihonua (see table p. 184).	January to Dec. 31, 1912; Jan. 1 to Dec. 31, 1913.	1:10	Daily			11.61	18.08	10.77	15.19	12.50	12.95	6.16	6.54	43.14	9.16	[b]148.1	2
5. Hilo	Oct. 1, 1912, to July 31, 1913	8-inch, 2:1	Monthly	32.70	6.20	9.00	12.20	5.20	11.40	7.00						[b] 86.7	3
6. Station No. 1	July 21, 1911, to Nov. 30, 1913	do	do	32.0	6.2	9.6	12.8	6.4	8.4	5.8	8.0	4.8	4.4	31.8		[b]135.2	5
7. Station No. 2	June 19, 1911, to July 31, 1913	do	do	19.8	5.8	10.8	16.8	8.4	18.8	10.2						[b] 94.1	3.5
8. Station No. 3	May 23, 1911, to July 31, 1913	do	do	32.0	5.6	14.0	19.8	5.6	20.0	10.6						[b]111.1	3.5
9. Station No. 4	May 24, 1911, to July 31, 1913	do	do	36.0	6.6	17.0	25.2	9.2	23.4	11.8						[b]132.7	3.5
10. Station No. 5	June 30, 1911, to July 31, 1913	do	do	35.6	6.2	16.2	27.2	9.6	21.2	14.0						[b]133.5	3.5
11. Station No. 6	Nov. 4, 1911, to June 30, 1913	13-inch, 5:1	Bimonthly	35.0		35.5		30.0								[b]103.5	3.0
12. Station No. 7	do	do	do	30.0		26.5		23.0								[b] 82.5	3
13. Station No. 8	Nov. 3, 1911, to June 30, 1913	do	do	26.5		23.0										[b] 51.5	2
14. Station No. 9	do	do	do	27.5		23.5		21.0								[b] 75.0	3
15. Station No. 10	Dec. 31, 1911, to June 30, 1913	do	do	30.5		25.5		26.0								[b] 85.0	3
16. Kukaiau ranch (see table, p. 185).	Jan. 1, 1911, to Dec. 31, 1913	Owned by Kukaiau Ranch Co.	Daily	3.08	3.29	1.64	3.45	5.46	2.66	0.	2.35	1.36	.30	22.03	17.20	64.8	2
17. Puukihe (see table, p. 185).	January, 1912,[e] to Dec. 31, 1913	do	Monthly													43.4	6
18. Reservoir No. 13 (see table, p. 184).	Jan. 1 to Dec. 31, 1913		Daily	3.48	9.31	3.15	3.19	3.98	2.40	1.82	4.46	5.05	.53	16.83	17.42	73.62	2
19. Near Honokaa (see table p. 184).	June, 1910, to Dec. 31, 1913		do	2.96	6.54	2.80	7.95	4.62	2.32	1.77	4.36	2.86	.50	17.63	21.67	77.98	2
20. Ahualoa homesteads (see table, p. 184).	Jan. 1 to Dec. 31, 1913		do	2.03	3.72	1.98	5.68	6.20	3.02	2.42	4.28	2.81	.59	25.78	16.95	77.46	2
21. Waima (see table, p. 185).	Apr. 1 to Dec. 31, 1913		do				5.92	5.09	6.33	3.62	4.06	2.96	.67	19.82	11.23	[b] 61.7	2
22. Lower Koiawe (see table, p. 185).	September, 1910, to Dec. 31, 1913		do	4.45	4.44	4.67	6.77	6.58	7.41	4.37	4.86	3.96	1.49	18.13	14.04	83.17	2
23. Upper Koiawe (see table, p. 185).	January, 1912, to Dec. 31, 1913		do				7.60	10.10	13.50	5.08	9.00	3.38	2.63	22.76	8.93	85.0	2
24. Alakahi - Waipio, lower (see table, p. 185).	September, 1910, to Dec. 31, 1913		do	5.39	7.61	9.49	12.35	12.98	15.45	8.45	9.58	9.62	2.97	33.83	25.29	159.0	6
25. Alakahi-Waipio, upper (see table, p. 185).	Jan. 1 to Dec. 31, 1913		do	4.87	9.15	9.55	19.72	10.42	16.97	13.30	11.72	7.28	4.27	41.30	14.85	169.4	6
26. Lower Kawainui (see table, p. 185).	September, 1910, to Dec. 31, 1913		do	3.94	6.48	6.93	8.80	8.64	12.01	6.32	9.20	5.68	2.21	34.44	27.22	132.9	2
27. Upper Kawainui (see table, p. 185).	July, 1907, to Dec. 31, 1913		do	10.41	11.39	15.73	28.82	14.64	24.54	20.92	18.46	13.75	6.17	56.62	18.86	246.3	6
28. Honokane mauka	Jan. 1 to Oct. 31, 1913		do	5.35	8.16	7.25	13.57	10.46	13.04	10.91	9.21	6.29	3.40			[b] 92.64	5
29. Kaauhuhu (see table, p. 185).	Mar. 18, 1912, to Dec. 31, 1913		do	2.60	4.71	2.29	6.39	3.72	6.56	4.00	3.34	2.51	2.01	11.53	10.10	61.76	2

[a] Includes estimated evaporation.
[b] Precipitation for part of year 1913 for which records are available.
[c] Precipitation Jan. 1 to Nov. 21, 1913, when gage was removed.
[d] Gage found leaking; new gage installed Apr. 1.
[e] Precipitation for year 1912=38.7 inches; includes 6 inches for estimated evaporation.

Maximum precipitation, in inches, at rainfall stations maintained during 1913.

Month.	Kauai.							
	13. Waimea.		20. Hanapepe Valley near Koula.		29. Summit camp, Hanalei.		30. Kapaka.	
	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.
January	1.20	0.70	9.08	1.74	17.92	2.21	9.82	1.42
February	1.96	.73	3.54	.65	8.93	2.65	7.84	2.00
March	0	0	5.05	.66	15.49	2.46	11.57	1.83
April	.21	.19	11.26	2.19	17.04	2.24	7.43	1.36
May	4.51	2.32	9.42	2.98	21.47	7.00	10.46	2.30
June	2.95	2.75	10.92	4.50	14.47	4.62	8.53	1.78
July	1.23	.81	7.73	1.28	12.27	1.62	9.03	1.22
August	.37	.11	10.44	1.96	11.91	1.09	7.67	.86
September	.78	.15	3.66	.72	8.95	1.69	5.08	.68
October	6.10	3.81	14.18	2.63	13.80	1.39	6.93	1.58
November	2.18	1.73	25.61	4.97	31.16	3.82	19.10	2.87
December	.09	.06	.69	.29	7.81	2.55	9.49	3.62
For 1913	21.58	3.81	111.58	4.97	181.22	7.00	112.95	3.62
Estimated evaporation	2.00	.....	2.00	.....	2.00	.....	2.00	.....
	23.58	.....	113.58	.....	183.22	.....	114.95	.....

Month.	Kauai.				Oahu.			
	32. Power house near Wainiha.		33. Intake of Wainiha canal.		7. Makaha near Waianae.		9. Hawaiian Preserving Co.	
	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.
January	8.39	2.76	6.91	1.69	5.95	1.64	.....	.....
February	10.50	2.85	6.01	1.05	3.43	1.30	.....	.....
March	12.41	2.75	27.99	9.40	6.26	4.00	2.32	0.59
April	10.51	1.61	13.68	2.61	3.94	1.90	4.00	.51
May	5.22	1.43	7.25	1.55	13.62	6.40	5.32	1.76
June	5.44	.99	10.22	1.65	6.59	3.00	0	.....
July	6.92	1.97	11.83	2.50	1.39	.64	2.36	1.00
August	7.21	.81	9.54	1.15	4.02	2.60	3.57	.85
September	3.15	.81	5.20	1.47	4.22	2.60	3.51	.37
October	5.22	1.77	9.18	3.35	8.80	4.70	4.76	1.30
November	17.34	1.89	28.03	4.90	7.78	2.21	5.78	1.27
December	8.65	4.39	8.81	3.18	12.41	9.14	.82	.32
For 1913	100.96	4.39	144.65	9.40	78.41	9.14	32.44	1.76
Estimated evaporation	2.00	.....	2.00	.....	2.00	.....	2.00	.....
	102.96	.....	146.65	.....	80.41	.....	34.44	.....

Month.	Hawaii.							
	4. Piihonua.		18. Reservoir No. 13.		19. Near Honokaa.		20. Ahualoa homesteads.	
	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.	Rainfall.	Maximum in 24 hours.
January	.....	.....	3.48	1.27	2.96	0.80	2.03	0.54
February	.....	.....	9.31	3.00	6.54	2.00	3.72	.72
March	11.61	1.96	3.15	1.16	2.80	.82	1.98	.72
April	18.08	1.95	3.19	1.16	7.95	1.73	5.68	1.47
May	10.77	3.20	3.98	1.12	4.62	1.80	6.20	1.75
June	15.19	6.00	2.40	1.25	2.32	1.68	3.02	.77
July	12.50	1.75	1.82	.45	1.77	.93	2.42	1.05
August	12.95	2.40	4.46	.85	4.36	1.08	4.28	.66
September	6.16	1.10	5.05	1.85	2.86	.70	2.81	.80
October	6.54	1.71	.53	.12	.50	.25	.59	.14
November	43.14	6.00	16.83	3.62	17.63	3.35	25.78	7.06
December	9.16	2.07	17.42	5.00	21.67	9.20	16.95	6.37
For 1913	146.1	6.00	71.62	5.00	75.98	9.20	75.46	7.06
Estimated evaporation	2.0	.....	2.00	.....	2.00	.....	2.00	.....
	148.1	.....	73.62	.....	77.98	.....	77.46	.....

Maximum precipitation, in inches, at rainfall stations maintained during 1913—Contd.

Month.	Hawaii.							
	21. Waima.		22. Lower Koiawe.		23. Upper Koiawe.		24. Alakahi-Waipio, lower.	
January	.....	.....	4.45	1.14	.....	.....	5.39	1.57
February	.....	.....	4.44	1.22	.....	.....	7.61	1.58
March	.....	.....	4.67	.75	.....	.....	9.49	1.83
April	5.92	1.20	6.77	1.36	7.60	1.00	12.35	3.10
May	5.09	.95	6.58	.95	10.10	2.00	12.98	1.75
June	6.33	1.50	7.41	1.55	13.50	2.10	15.45	2.89
July	3.62	1.00	4.37	1.10	5.08	.60	8.45	1.75
August	4.06	1.30	4.86	.90	9.00	1.70	9.58	1.74
September	2.96	.88	3.96	.96	3.38	.57	9.62	3.52
October	.67	.25	1.49	.40	2.63	.65	2.97	.49
November	19.82	5.20	18.13	4.20	22.76	4.55	33.83	6.92
December	11.23	6.20	14.04	4.30	8.93	2.35	25.29	9.25
For 1913	59.70	6.20	81.17	4.30	82.98	4.55	153.0	9.25
Estimated evaporation	2.00	.....	2.00	.....	2.00	.....	6.0	.....
	61.7	.....	83.17	.....	85.0	.....	159.0	.....

Month.	Hawaii.							
	25. Alakahi-Waipio, upper.		26. Lower Kawainui.		27. Upper Kawainui.		29. Kaauhuhu.	
January	4.87	1.60	3.94	0.97	10.41	3.90	2.60	1.17
February	9.15	1.65	6.48	1.22	11.39	1.75	4.71	.66
March	9.55	2.10	6.93	1.40	15.73	3.63	2.29	.45
April	19.72	3.65	8.80	1.60	28.82	4.50	6.39	1.32
May	10.42	2.01	8.64	1.15	14.64	2.10	3.72	.89
June	16.97	2.60	12.01	2.20	24.54	3.05	6.56	1.26
July	13.30	2.21	6.32	1.20	20.92	3.63	4.00	1.90
August	11.72	2.30	9.20	1.80	18.46	3.32	3.34	.98
September	7.28	1.40	5.68	1.50	13.75	3.15	2.51	1.02
October	4.27	.60	2.21	.45	6.17	.73	2.01	.45
November	41.30	8.50	34.44	8.00	56.62	13.32	11.53	2.02
December	14.85	4.55	27.22	11.03	18.86	5.87	10.10	1.94
For 1913	163.4	8.50	131.87	11.03	240.3	13.32	59.76	2.02
Estimated evaporation	6.0	.....	2.00	.....	6.0	.....	2.00	.....
	169.4	.....	133.9	.....	246.3	.....	61.76	.....

Precipitation at rainfall stations maintained on Hawaii during 1911 and 1912.

Month.	16. Kukaiau ranch.		17. Puukihe.
	1911	1912	1912
	Inches.	*Inches.*	*Inches.*
January	12.49	0	.....
February	43.44	22.04	.....
March	3.30	10.61	.....
April	11.74	13.15	.....
May	9.49	1.93	.....
June	3.24	.11	.....
July	2.53	.67	.....
August	3.69	1.42	.....
September	3.77	1.47	.....
October	3.39	4.55	.....
November	4.72	6.53	.....
December	5.71	1.51	.....
Year	[a] 107.5	[a] 64.0	[b] 38.7

[a] Two inches should be added for estimated evaporation.
[b] Includes 6 inches estimated evaporation.

INDEX.

A.

Page.

Acre-foot, definition of 15
Akulikuli Spring near Kealia, Kauai 60–61
Alo Stream near Huelo, Maui 137
Anahola ditch at Kiokala, near Kealia, Kauai 64–65
Anahola River above dam at Kiokala, near Kealia, Kauai 63–64
Appropriation, character and purpose of 7–8
Austin, H. A. R., work of 22
Authority for work 7–8

B.

Bailey, C. T., work of 22
Bitting, C. C., cooperation of 175
Bluett, P. W. P., cooperation of 175
Bridge station, definition of 14

C.

Cable station, definition of 14
Christiansen, E. O., work of 22
Clark, C. F., cooperation of 175
Computations, accuracy of 21
methods of obtaining 17–20
Conservation fund, levying of 7–8
Cooperation, terms of 8–9
Cross-section, determination of 11
Current-meter, description of 11

D.

Definition of terms 15–16
Discharge, methods of computing 17–20
Discharge measurements, accuracy of 20–21
tables of, explanation of 21
Division of work 22
Dort, J. C., work of 22
Dort, S. W., work of 22

E.

East Branch or Fork. *See* name of main stream.
East Maui, list of stations on 25–26
Eleele, Kauai, Hanapepe River near 37–38
Hanapepe ditch near 40–41
Hiloa ditch near 38–40
Equivalents, convenient 15

G.

Gages, method of installation 14
Gaging stations, classes of 10
kinds used 13–14
list of 22–27
records of 27–151
Gallons per minute, definition of 15
Goo, E. E., work of 22
Goo, R. M. S., work of 22
Grove Farm Plantation, cooperation of 175

H.

Page.

Haipuaena Stream near Huelo, Maui (old and new stations) 134–135
Halekua Stream near Waimea, Kauai 32–33
Hamakua ditch at main weir, Puualala, near Waimea, Hawaii 168
Hamakua group, Hawaii, stream-flow measurements on 168–170
Hanalei, Kauai, Kuna ditch near 68–69
Hanalei River near Hanalei, Kauai 67–68
Hanamaulu ditch near Lihue, Kauai 48–49
Hanamaulu River at Kapaia near Lihue 45–46
Hanapepe ditch near Eleele, Kauai 40–41
near Hanapepe, Kauai 41–42
Hanapepe River at Koula, near Eleele, Kauai 37–38
Hardy, W. V., work of 22
Hawaii, conditions in various districts of. 152–153
list of stations on 26–27
miscellaneous measurements on 174
rainfall stations on 178–179
stream-flow records on 153–174
table showing precipitation on 183
Hawaii Mill Co., cooperation of 175
Hawaii Preserving Co., cooperation of 175
Hawaiian Commercial & Sugar Co., cooperation of 175
Hawaiian Irrigation Co., cooperation of 175
Hawaiian Sugar Co., cooperation of 175
Hilo, Hawaii, Honolii River at Kaiwiki, near. 167
stations at 2,700-foot level, near 153–165
Wailuku River near 166–167
Hiloa ditch near Eleele, Kauai 38–40
Honokaa Sugar Co., cooperation of 175
Honokahau, Maui, Honolua Stream near .. 117–118
Kahakuloa Stream near 113–114
Honokahau ditch at intake, near Honokahau, Maui 116
Honokahau Stream near Honokahau, Maui 115–116
Honokawai ditch near Lahaina, Maui 119–120
Honokawai Stream near Lahaina, Maui 118
Honolii River at Kaiwiki, near Hilo, Hawaii. 167
Honolua Stream near Honokahau, Maui ... 117–118
Honolulu, Oahu, East Branch of Manoa Stream at upper Manoa Valley, near 82–83
Kahuawai Spring near 79
Kalihi Stream at Kioi Pool, near 74
Lulumaha ditch at upper Nuuanu reservoir, near 76–77
Manoa Stream near 80–82
Nuuanu Stream at Luakaha weir in upper Nuuanu Valley, near 75
below reservoir No. 2 wasteway, near 75–76

Page.
Honolulu, Oahu, Pauoa Stream at upper Pauoa Valley, near 78–79
Waiomao Stream at upper Palolo Valley, near 85–86
West Branch of Manoa Stream at upper Manoa Valley, near..... 84–85
Honolulu Ranch, cooperation of..... 175
Honopou Stream near Huelo, Maui..... 149–151
Hoolawaliilii Stream near Huelo, Maui.... 148–149
Hoolawanui Stream near Huelo, Maui..... 147–148
Huelo, Maui, Alo Stream near..... 137
Haipuaena Stream near (old and new stations)..... 134–135
Honopou Stream near..... 149–151
Hoolawaliilii Stream near..... 148–149
Hoolawanui Stream near..... 147–148
Kailua Stream near..... 145–146
Nailiilihaele Stream near..... 144–145
Oanui Stream near..... 146–147
Oopuola Stream near..... 139–140
Puohakamoa Stream near (old and new stations)..... 135–137
Spreckels ditch near..... 141–144
Waikamoi Stream near..... 138–139
Huleia River near Lihue, Kauai..... 43–44

I.

Iao Stream near Wailuku, Maui..... 104–105
Integration method, use of..... 12–13
Investigations, authority for..... 7–8
scope of..... 9

K.

Kaehulua Stream at Kuhinoa weir, near Kealia, Kauai..... 57–58
Kaehulua Stream, North Fork, at Kainahola weir, near Kealia, Kauai..... 58–59
Kaehulua Stream, South Fork, at Wainamuamu weir, near Kealia, Kauai. 56–57
Kahakuloa Stream near Honokahua, Maui..113–114
at Kahakuloa, near Waihee, Maui..... 113
Kahanaiki Stream, North Branch, in Kailua Valley, near Kailua, Oahu..... 96–97
Kahanaiki Stream, South Branch, in Kailua Valley, near Kailua, Oahu..... 96
Kaheaku, John, work of..... 22
Kahoma ditch at weir, near Lahaina, Maui. 121–122
Kahuawai Spring at upper Pauoa Valley, near Honolulu, Oahu..... 79
Kailua, Oahu, Kaimi Stream in Kailua Valley, near..... 91–92
Kamakalepo Stream in Kailua Valley, near..... 93–94
Makawao Stream in Kailua Valley, near. 89–90
North Branch of Kahanaiki Stream in Kailua Valley, near..... 96–97
Pohakea Stream in Kailua Valley, near. 94–95
South Branch of Kahanaiki Stream in Kailua Valley, near..... 96
Kailua Stream near Huelo, Maui..... 145–146
Kaimi Stream in Kailua Valley, near Kailua, Oahu..... 91–92
Kainahola weir near Kealia, Kauai, North Fork of Kaehulua Stream at..... 58–59
Page.
Kaiwiki near Hilo, Hawaii, Honolii River at..... 167
Kalihi Stream at Kioi Pool, near Honolulu, Oahu..... 74
Kalihiwai River near Kilauea, Kauai..... 65–66
Kamakalepo Stream in Kailua Valley, near Kailua, Oahu..... 93–94
Kanaha ditch near Lihue, Kauai..... 51–53
Kaneha ditch near Kealia, Kauai..... 62–63
Kapaa River near Kealia, Kauai..... 59–60
Kapahi ditch at Kapahi, near Kealia, Kauai. 61–62
Kapaia near Lihue, Kauai, Hanamaulu River at..... 45–46
Kauai, list of stations on..... 22–23
miscellaneous measurements on..... 73
rainfall stations on..... 175–176
stream-flow records on..... 27–73
table showing precipitation on..... 180–181
Kauai Electric Co., cooperation of..... 175
Kauaula ditch near Lahaina, Maui..... 126–127
Kaukonahua Stream, Left Branch of North Fork, near Wahiawa, Oahu.... 100–101
Right Branch of North Fork, near Wahiawa, Oahu..... 99–100
South Fork, near Wahiawa, Oahu..... 102
Kawaikoi Stream near Waimea, Kauai..... 28–29
Kealia, Kauai, Akulikuli Spring near..... 60–61
Anahola ditch at Kiokala, near..... 64–65
Anahola River above dam at Kiokala, near..... 63–64
Kaehulua Stream at Kuhinoa weir, near. 57–58
Kaneha ditch near..... 62–63
Kapaa River near..... 59–60
Kapahi ditch at Kapahi, near..... 61–62
Konohiki Stream at Makakualele weir (mauka), near..... 55–56
North Fork of Kaehulua Stream at Kainahola weir, near..... 58–59
South Fork of Kaehulua Stream at Wainamuamu weir, near..... 56–57
Kehena ditch at Honokane Mauka, near North Kohala, Hawaii..... 173
Kekaha Sugar Co., cooperation of..... 175
Kennedy, H. M., work of..... 22
Kilauea, Kauai, Kalihiwai River near..... 65–66
Kimble, Howard, work of..... 22
Kioi Pool near Honolulu, Oahu, Kalihi Stream at..... 74
Kiokala, near Kealia, Kauai, Anahola ditch at..... 64–65
Anahola River above dam at..... 63–64
Kohala ditch near Kohala, Hawaii..... 170–172
Kohala group, Hawaii, stream-flow records for..... 170–172
Konohiki Stream at Makakualele weir (mauka), near Kealia, Kauai.... 55–56
Koula, Kauai, Hanapepe ditch at..... 40–41
Hanapepe River at..... 37–38
Kuhinoa weir near Kealia, Kauai, Kaehulua Stream at..... 57–58
Kukaiau Ranch Co., cooperation of..... 175
Kukuihaele, Hawaii, New Hamakua ditch at main weir near..... 169–170
Kuna ditch near Hanalei, Kauai..... 68–69

L.

Page.

Lahaina, Maui, Honokawai ditch near.... 119–120
Honokawai Stream near..... 118
Kahoma ditch at weir, near..... 121–122
Kauaula ditch near..... 126–127
Lahainaluna ditch near..... 124–125
Lahainaluna Stream near..... 122–124
Launiupoko Stream near..... 127
Lahainaluna ditch near Lahaina, Maui.... 124–125
Lahainaluna Stream near Lahaina, Maui.. 122–124
Launiupoko Stream near Lahaina, Maui..... 127
Lihue, Kauai, East Branch of North Fork of Wailua River near..... 53–55
Hanamaulu ditch near..... 48–49
Hanamaulu River at Kapaia, near..... 45–46
Huleia River near..... 43–44
Kanaha ditch near..... 51–53
North Fork of Wailua River near..... 50–51
South Fork of Wailua River above Waiehu Falls near..... 46–47
Lihue ditch near Lihue, Kauai..... 49–50
Luakaha weir in upper Nuuanu Valley, near Honolulu, Oahu, Nuuanu Stream at..... 75
Lulumaha ditch at upper Nuuanu reservoir, near Honolulu, Oahu..... 76–77

M.

Makakualele weir (mauka) near Kealia, Kauai, Konohiki Stream at..... 55–56
Makawao ditch at Makawao flume, near Waimanalo, Oahu..... 88
Makawao Stream in Kailua Valley, near Kailua, Oahu..... 89–90
Makaweli, Kauai, Olokele ditch at Tunnel No. 12, near..... 33–34
Olokele ditch at weir, near..... 35–36
Makaweli River near Waimea, Kauai..... 31–32
Makee Sugar Co., cooperation of..... 175
Maniania ditch near Wailuku, Maui..... 105
Manianiaula, near Waikane, Oahu, Waiahole Stream at..... 97–98
Manoa Stream at College of Hawaii, near Honolulu, Oahu..... 80–82
at upper Manoa Valley, near Honolulu, Oahu..... 80
Manoa Stream, East Branch, at upper Manoa Valley, near Honolulu, Oahu..... 82–83
Manoa Stream, West Branch, at upper Manoa Valley, near Honolulu, Oahu..... 84–85
Man's water, definition of..... 16
Maui, list of stations on..... 24–26
miscellaneous measurements on..... 151–152
rainfall stations on..... 177–178
stream-flow records on..... 104–152
table showing precipitation on..... 182
Maui Board of Supervisiors, cooperation of.. 175
May, W. S., cooperation of..... 175
McClellan, J., cooperation of..... 175
Measurements, stream-flow, methods of obtaining..... 9–10
Meyer, F., cooperation of..... 175
Million gallons, definition of..... 15
Miner's inch, definition of..... 15
Miscellaneous measurements on Hawaii..... 174
on Kauai..... 73

Page.

Miscellaneous measurements on Maui..... 151–152
on Oahu..... 103
Multiple-point method, use of..... 12

N.

Nailiilihaele Stream near Huelo, Maui..... 144–145
New Hamakua ditch at main weir near Kukuihaele, Hawaii..... 169–170
North Branch or Fork. *See* name of main stream.
North Kohala, Hawaii, Kehena ditch at Honokane Mauka, near..... 173
North Waiehu Stream near Wailuku, Maui. 109–110
Nuuanu reservoir, upper, near Honolulu, Oahu, Lulumaha ditch at..... 76–77
Nuuanu Stream at Luakaha weir in upper Nuuanu Valley, near Honolulu, Oahu..... 75
below reservoir No. 2 wasteway, near Honolulu, Oahu..... 75–76

O.

Oahu, list of stations on..... 23–24
miscellaneous measurements on..... 103
rainfall stations on..... 176–177
stream-flow records on..... 74–103
table showing precipitation on..... 181
Oanui Stream near Huelo, Maui..... 146–147
Olokele ditch at Tunnel No. 12, Makaweli, Kauai..... 33–34
at weir near Makaweli, Kauai..... 35–36
Olowalu ditch No. 1 near Olowalu, Maui.. 129–130
Olowalu Stream near Olowalu, Maui..... 128–129
Olowalu Sugar Co., cooperation of..... 175
Oopuola Stream near Huelo, Maui..... 139–140

P.

Pacific Sugar Mill, cooperation of..... 175
Palolo ditch near Waikapu, Maui..... 132–133
Palolo Valley, upper, near Honolulu, Oahu, Waiomao Stream at..... 85–86
Pauoa Stream at upper Pauoa Valley, near Honolulu, Oahu..... 78–79
Pauoa Valley, upper, near Honolulu, Oahu, Kahuawai Spring at..... 79
Pioneer Mill Co., cooperation of..... 175
Pohakea Stream in Kailua Valley, near Kailua, Oahu..... 94–95
Poowaiomahaihai ditch near Waimea, Kauai. 36–37
Princeville ranch (W. F. Sanborn), cooperation of..... 175
Puohakamoa Stream near Huelo, Maui (old and new stations)..... 135–137
Puualala, near Waimea, Hawaii, Hamakua ditch at main weir..... 168

R.

Rainfall stations, table showing maximum precipitation..... 184–185
table showing precipitation and evaporation..... 180–183
Rainfall stations in Hawaii, list of..... 175–179
Rain gaging, explanation of..... 174–175
Rating table, use of..... 17–18
basis of..... 21

Page.
Run-off, definition of 15
method of obtaining 11–14

S.

Sanborn, W. F., cooperation of 175
Scope of work 9
Second-foot, definition of 15
Second-feet per square mile, definition of 15
Single-point method, use of 12
Soundings, method of obtaining 11
South Branch or Fork. *See* name of main stream.
South Side Waikapu ditch near Waikapu, Maui 131–132
South Waiehu ditch near Wailuku, Maui .. 107–108
South Waiehu Stream near Wailuku, Maui. 106–107
Spreckels ditch near Huelo, Maui 141–144
near Waihee, Maui 112
Stream measurement, accuracy of 21
field methods of 9–10
methods of computing 17–20

T.

Tables, explanation of 20–21
Terms, definition of 15–16

V.

Valentine, Alex., cooperation of 175
Velocity-area measurements, methods of making 11–14

W.

Wading station, definition of 14
Wahiawa, Oahu, Left Branch of North Fork of Kaukonahua Stream, near .. 100–101
Wahiawa, Oahu, Right Branch of North Fork of Kaukonahua Stream near 99–100
Wahiawa, Oahu, South Fork of Kaukonahua Stream near 102
Waiahole Stream at Manianiaula, near Waikane, Oahu 97–98
Waialae River near Waimea, Kauai 29–30
Waiehu Falls, near Lihue, Kauai, South Fork of Wailua River above 46–47
Waiehu ditch, South, near Wailuku, Maui. 107–108
Waiehu Stream, North, near Wailuku, Maui 109–110
Waiehu Stream, South, near Wailuku, Maui 106–107
Waihee Stream near Waihee, Maui 110–111

Page.
Waihee, Maui, Kahakuloa Stream at Kahakuloa, near 113
Spreckels ditch near 112
Waikamoi Stream near Huelo, Maui 138–139
Waikane, Oahu, Waiahole Stream at Manianiaula, near 97–98
Waikapu, Maui, Palolo ditch near 132–133
South Side Waikapu ditch near 131–132
Waikapu Stream near Waikapu, Maui 131
Wailua River, East Branch of North Fork, near Lihue, Kauai 53–55
Wailua River, North Fork, near Lihue, Kauai 50–51
Wailua River, South Fork, above Waiehu Falls, near Lihue, Kauai 46–47
Wailuku, Maui, Iao Stream near 104–105
Manianiа ditch near 105
North Waiehu Stream near 109–110
South Waiehu ditch near 107–108
South Waiehu Stream near 106–107
Wailuku River near Hilo, Hawaii 166–167
Wailuku Sugar Co., cooperation of 175
Waimanalo, Oahu, Makawao ditch at Makawao flume, near 88
Waimanalo ditch below main reservoir on the Waimanalo plantation, near Waimanalo, Oahu 86–88
Waimea, Hawaii, Hamakua ditch at main weir, Puualala, near 168
Waimea, Kauai, Halekua Stream near 32–33
Kawaikoi Stream near 28–29
Makaweli River near 31–32
Poowaiomahaihai ditch near 36–37
Waialae River near 29–30
Waimea ditch near Waimea, Kauai 31
Waimea River near Waimea, Kauai 27–28
Wainamuamu weir near Kealla, Kauai, South Fork of Kaehulua Stream at 56–57
Wainiha River (East and West channels) at power house, near Wainiha, Kauai 69–73
Waiomao Stream at upper Palolo Valley, near Honolulu, Oahu 85–86
Water-stage recorder, description of 14
Weir measurements, advantages of 10
West Branch or Fork. *See* name of main stream.
West Maui, list of stations on 24–25
White, G. R., work of 22
Willard, C. R., cooperation of 175
Wood, B. D., work of 22

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